

# ANNALS

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1. *Cretaceous Fossils from Angola (Lamellibranchia and Gastropoda).*—  
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(With Plates I-V and Two Text-figures.)

SOME few years ago the South African Museum acquired, through the courtesy of Dr. L. Reinecke, an interesting collection of Cretaceous fossils from the Loanda province of Angola, collected by the field officers of the Companhia de Petroleo de Angola. The Cephalopoda and Echinoidea of this collection have been described by Dr. Haughton, who was able to show that an Upper Albian horizon exists in the Loanda embayment containing a fauna essentially similar to that described by Spath from the province of Benguella, and that the Teba Formation is undoubtedly Senonian. Previous to the publication of the above paper the only Senonian forms definitely known from Angola were three Lamellibranchia from the province of Benguella and a *Didymoceras* mentioned by Spath from Barra do Dande.\*

The present paper deals with the Lamellibranchia and Gastropoda of the above collection, and with a small but extremely interesting

\* Since this paper was written the writer has seen an important paper by Velez Mouta and Alexandre Borges, entitled *Communication de la Mission Géologique de l'Angola sur le Crétacé du Littoral de l'Angola (Districts de Benguela et Mossamedes)*, which was read at the fourteenth session of the Congrès Géologique International (Spain, 1926) and published in Lisbon by the Agência Geral das Colónias. The Cretaceous deposits are described in some detail and extensive fossil lists are given, including many new records for the area. *Roudaireia* [= *Veniella*] *dru*i is figured for the first time from Angola, from S. Nicolau, and the Pondoland *Pseudomelania sutherlandi* (Baily) is listed from the same area. It is doubtful, however, if much value can be attached to many of the identifications, e.g. *Solarium* [= *Semisolarium*] *bailyi*; Gabb, a Pondoland Upper Senonian form, is listed among Albian forms.

collection made by Mr. W. J. Reynolds along the coastal strip from Mossamedes to the Benguella area. Though a large number of the specimens are very imperfect or in the condition of casts, and many had, therefore, to be completely ignored, some interesting results have been obtained, notably the recognition of a Senonian fauna near Mossamedes and the conclusion that the Senonian of Angola is closely related to that of Pondoland and Zululand. Some new light is, therefore, thrown on the palaeo-geography of that period.

The writer wishes to express his thanks to those who have aided the work from time to time with useful suggestions and criticisms, and particularly to Dr. S. H. Haughton, through whose interest the investigation was commenced, to Mr. Henry Woods, M.A., who has kindly read through the first draft of the paper, and to Mr. L. R. Cox, M.A., who has given the writer assistance in the British Museum.

In the following account the numbers in heavy type refer to the bibliography appended. The South African Museum catalogue numbers are also given.

#### LIST OF FOSSILS.

##### 1. Dombe Grande.

- Neithea tricostata* (Coq.).
- Spondylus angolensis* sp. nov.
- Crassatellites* spp.
- Lucina angolensis* sp. nov.
- Cardium* (*Laevicardium* ?) sp.
- Cyprimeria* ? sp.
- Nerita* cf. *malheiroi* Choffat.
- Gyrodont* cf. *genti* (Sow.).

##### 2. Catumbella.

- Cardium* (*Trachycardium* ?) sp.
- Chenopus* sp.

##### 3. Benguella.

- Trigonia* cf. *ethra* Coq.
- Neithea tricostata* (Coq.).

##### 4. Uchi district.

- Trigonia* cf. *ethra* Coq.
- Neithea aequicostata* (Lam.).
- „ *quinquecostata* (Sow.).
- „ *tricostata* (Coq.).
- Nerita malheiroi* Choffat.
- Pterodonta* cf. *inflata* d'Orb.

5. Chipupo district.  
*Astarte* sp.  
*Lucina* ? sp.  
*Gyrodes* cf. *genti* (Sow.).
6. Camballa area, Cuvo River (various localities).  
*Trigonoarca* cf. *diceras* (Seg.).  
*Ostrea vesicularis* Lam.  
*Alectryonia* cf. *syphax* (Coq.).  
*Exogyra* cf. *conica* (Sow.).  
*Neithea tricostata* (Coq.).  
,, *welwitschi* (Choffat).
7. Caputo Hills, Cuvo River.  
*Metacerithium trimonile* (Mich.).
8. Cabo Ledo, Quissama.  
*Inoceramus* sp.
9. Hills west of well location, Quimbaixie.  
*Barbatia* ? sp.  
*Astarte* sp.  
*Chenopus (Drepanochilus) reineckei* sp. nov.
10. Mumbondo (various localities).  
*Chenopus (Drepanochilus) reineckei* sp. nov.  
*Pterodonta* aff. *elongata* d'Orb.
11. East of Dondo—Quixinge Road, Quissama.  
*Exogyra olisiponensis* Sharpe.  
*Cyprina* sp.
12. Lifune Seep, Lifune River.  
*Nerita* cf. *malheiroi* Choffat.
13. Chio (various localities).  
*Lucina reineckei* sp. nov.  
*Baroda* ? spp.  
*Avellana incrassata* (Sowerby).
14. Muscima.  
*Baroda* ? sp.
15. Capolo (15 km. S., 75 km. E. of).  
*Pleuromya* ? sp.
16. Carimba.  
*Inoceramus* sp.  
*Macrocallista* ? sp.

17. Massangano Fort.  
*Pholadomya* aff. *tigris* Noetling.  
*Cardium denticulatum* Baily.
18. Massangano area, S. of river.  
*Plicatula* sp.  
*Venilicardia* cf. *nicaisei* (Coq.).  
*Cyprimeria* ? sp.  
*Nerita angolensis* sp. nov.  
*Cryptorhytis* cf. *bleicheri* (T. and Peron).
19. Near Hombo, Quissama.  
*Venilicardia* cf. *nicaisei* (Coq.).  
*Protocardia hillana* (Sow.).
20. Baba district, Mossamedes Province.  
*Trigonoarca angolensis* sp. nov.  
 ,, cf. *trichinopolitensis* (Forbes).  
*Nemodon natalensis* (Baily).  
*Veniella drui* (Munier-Chalmas).  
*Cardita barroneti* Munier-Chalmas.  
*Cardium* (*Trachycardium*) *reynoldsi* sp. nov.  
*Tellina* (*Palaeomoera* ?) sp.  
*Turritella* (*Haustator* ?) cf. *acanthophora* Müller.
21. Mesados Cavalleros, Mossamedes.  
*Lima* (*Mantellum*) sp.  
*Lithodomus* sp.  
*Eriphyla* cf. *forbesiana* Stol.  
 Various Gastropoda, among which *Turritella*, *Cerithium*, *Strombus*?, *Fusus*?, *Conus*?, and *Actaeon*? occur as casts and imperfect forms.

#### DISCUSSION OF THE FAUNAS.

(1) *Albian and Cenomanian of the Benguella Area.*—The Albian and Cenomanian of the Benguella area are well known through the early researches of Choffat (6, 7) and the more recent descriptions by R. Bullen Newton (5) and Spath (51) of material collected by Gregory (24). The age of the so-called "*Inflaticerias*-fauna" has been accurately determined by Spath, who states that it probably corresponds with his Beds XI–XIII at Folkestone, *i.e.* near the top of the Upper Albian, hence need not be further discussed here. No Cenomanian Ammonoidea are known from Angola, but Choffat was probably



right in regarding the beds overlying the *Pervinquieria*-bearing \* limestone as mainly Cenomanian. The specimens in the present collection from this area were unfortunately not collected with a due regard to horizon, and therefore most probably include both Albian and Cenomanian forms.

The localities Uchi and Chipupo are new. The occurrence at Uchi of *Trigonia* cf. *ethra*, *Neithea aequicostata*, *N. tricosata* and its varieties, and *Nerita malheiroi*, all of which occur in or below the *Pervinquieria* limestone at Dombe Grande or Lobito, suggests that the Albian only is represented among the forms from this locality. The Chipupo shells are casts, but include *Gyrodes* cf. *genti*, which is an Albian form.

(2) *Albian of the Loanda Embayment.*—The presence of the Upper Albian in the Loanda Cretaceous-Tertiary embayment has been well established by Haughton (28), who has shown that beds containing *Pervinquieria* occur at Benguella Velha, Camballa, and Cabo Ledo. The Albian age of the Camballa fossils is confirmed by the presence there of *Neithea tricosata*, and also of *Exogyra* cf. *conica*, *Trigonoarca* cf. *diceras*, and other forms. New localities are Caputo Hills, where the undoubtedly Albian *Metacerithium trimonile* occurs; Chio, from which comes *Avellana incrassata*; and Lifune River. *Exogyra olisiponensis* is in North Africa a Cenomanian-Turonian form, and the ages of the fossils of the remaining localities (9, 10, and 14) are doubtful.

(3) *Senonian of the Benguella Area.*—In the province of Benguella the presence of the Senonian was first definitely established by Choffat in 1905 (7), when he described *Cardita barroneti* Munier-Chalmas and *Roudaireia forbesiana* (Stoliczka) from the uppermost horizons of the Cretaceous of Dombe Grande, though he had recorded from there in 1888 (6, p. 26) sandstones containing *Ostrea baylei* Gueranger associated with impressions of *Roudaireia* and other forms. *C. barroneti* is characteristic of the Maestrichtian of Northern Africa, and *R. forbesiana* [*Veniella*] occurs in the Lower Senonian of India, the Coniacian and Santonian of Tunis, and has been recorded from the Manuan Creek area of Zululand, where Spath (48, p. 302) has recognised Coniacian Ammonoidea; the latter occurs also in the Campanian, as the South African Museum possesses numerous fine examples from Umkwelane Hill and Lake Itesa, Zululand, while there is a single cast undoubtedly representing this species in the Transvaal Museum's collection of Pondoland shells. The data relating to the ages of the two horizons recognised by Choffat are very meagre, but as *C. barroneti* is recorded in this paper in association with forms related to those of

\* *Pervinquieria* Böhm 1910 must replace *Inflaticerias* Stieler 1920. See 52, p. 79.

Pondoland, it seems probable that the upper horizon, Choffat's *Grès à C. barroneti*, is equivalent in age to the beds at Baba and to the Umzamba beds of Pondoland, which are usually regarded as Campanian. No other Senonian forms are known from this province, nor are any present in the collection here described.

(4) *Senonian of the Loanda Embayment*.—The wide extent of the Senonian in Angola was shown in 1925 (28, p. 265) by Haughton, who described from Carimba in the Loanda embayment several Ammonoidea of undoubtedly Senonian aspect and probably Upper Senonian. The Lamellibranchia from the Carimba localities give no additional evidence as to the age of the Carimba fauna.

The Massangano fauna is without doubt Senonian on the evidence of the forms listed above, and it is therefore interesting to note that Haughton has described *Placenticeras reineckei* from the Massangano area, a species which he has compared with Upper Senonian forms. *Cardium denticulatum* is common in the Campanian of Pondoland. *Pholadomya tigris* is a Senonian form, and *Nerita angolensis* sp. nov. appears to be more nearly related to *N. rugosissima* Forbes from the Ariyalur group of India than to any other species. The *Cyprimeria* is very like *C. analoga* (Forbes) from the Trichinopoli group and may be identical with an undescribed form from the Campanian of Pondoland in the collection of the Transvaal Museum.

Of the two species from Hombo, the *Venilicardia* has been compared with a Senonian species and occurs also at Massangano, while *Protocardia hillana* is a long-ranged and widespread species which is found also in the Pondoland deposits.

(5) *The Senonian of the Mossamedes Littoral*.—The collection made by Mr. W. J. Reynolds in the neighbourhood of Baba, near Mossamedes, includes only eight species, but these are very well preserved and of exceptional interest, as they not only prove the existence of Campanian deposits far to the south of the hitherto described Senonian horizons of Angola, but open up interesting questions in connection with the relationships of the Senonian of Angola to that of Pondoland and Zululand. *Nemodon natalensis* is a very distinct species characteristic of the Pondoland and Umkwelane Hill deposits. *Trigonoarca angolensis* sp. nov. has its nearest ally in *T. capensis* from Pondoland. *Veniella drui* has long been known from the Campanian and Maestrichtian of North Africa and is represented by fine undescribed specimens in the collections of the South African and Transvaal Museums from Pondoland. *Cardita barroneti* is from the Maestrichtian of North Africa, while the *Turritella* will be compared

with a Maestrichtian form from Aachen. *Trigonoarca trichinopolitensis* occurs in the Lower Senonian of India, but has not been recorded from the Senonian of South-East Africa. *Cardium reynoldsi* sp. nov. appears to be a very distinct form.

Three of the eight species from Baba are represented in Pondoland by identical or closely allied forms and two others are Maestrichtian. The age of the Umzamba beds of Pondoland has been regarded as Campanian by Woods (60, p. 346), as Upper Santonian by van Hoepen (50, p. 45), and as Campanian+Maestrichtian by Spath (50, p. 116). The Baba fauna can safely be regarded as of the same age as the Umzamba and Umkwelane Hill faunas, which are probably mainly, if not entirely, Campanian. Unfortunately there are no Ammonoidea from Baba to give confirmatory evidence.

The Baba beds appear to be of the same age as Choffat's *Grès à Cardita barroneti* at Dombe Grande, and are perhaps of the same age as the red calcareous sandstone of S. Nicolau north of Mossamedes (from which Gurich has recorded "*Trigonoarca*, ressemblant un peu à *Tr. Trichinopolitensis* Stol." and "*Cyprina*, voisins de *C. forbesi* Stol.," but without giving descriptions or figures), which Choffat in 1905 (7, p. 21 and p. 30) suggested was of the same age as his *Grès à Rondaireia Forbesi* at Dombe Grande.

Apparently of uppermost Cretaceous age is a collection of poorly preserved specimens, mostly Gastropoda, from Mesados Cavalleros near Mossamedes. The Gastropoda have a Tertiary aspect, but the *Eriphyla* appears to be closely allied to *E. forbesiana* from the Ariyalur group and the *Lithodomus* has been compared with a Senonian form. That the Cretaceous does occur near Mossamedes seems to be indicated by Choffat's reference to a *Cardium* and a *Trigonia* from "fazenda Vidal sur le Monte Cavaleiros" near Mossamedes (7, p. 21), though Bebiano (2) in his recent valuable map does not show the Cretaceous much to the south of the S. Nicolau river.

(6) *Palaeo-geographical Considerations*.—It has generally been assumed that in Albian times a Brazilio-Ethiopian continent stretched across the Atlantic and that direct communication between the Mediterranean and the Cape did not take place until after the close of the Cretaceous. The close relations of the Upper Albian fauna of Angola to that of the Mediterranean have been noted by Spath (51, pp. 154–158) and Bullen Newton (5, p. 562). Haug (27, p. 1357) has postulated a temporary connection between the Mediterranean and the Gulf of Guinea *via* the Sahara and the Sudan to explain the affinities of the faunas of those regions, and Gregory (25) has embodied

his views in a map which indicates the range of the Albian sea, which according to him invaded the Brazilio-Ethiopian continent in the form of a long arm stretching from the Tethys as far south as Angola. While the idea of such a Brazilio-Ethiopian continent has received wide support, it has been discarded in a recent paper by Spath (51a, p. 196), who points out that the support given by ammonite evidence to zoological provinces is valueless, as these provinces were based on comparisons of beds of different ages, and that the Upper Albian genus *Elobiceras*, formerly thought to be confined to the Angolan Gulf, is now known from practically all round Africa. While it must be admitted that the question of the Angolan Gulf has still to be definitely settled, it is suggested that too much reliance should not be placed on forms which are almost universal in their distribution, and so the land barrier south of Angola during Albian times is provisionally accepted.

On the other hand it is certain that permanent communication had been established between the Mediterranean and the southern seas *via* the west coast of Africa in Eocene times, for the marine Tertiary from the vicinity of Bogenfels on the south-west African coast, originally described by Böhm and Weissermel (3) as Lower Miocene, is now known to be of earlier date and related to the Eocene of West Africa and Egypt (30, vol. ii, chap. xix, and 17, p. 349).

Hitherto the scanty and inconclusive remains of post-Albian Cretaceous forms in Angola have led investigators to conclude that the connection between South Africa and Brazil persisted through the Senonian, in spite of the fact that certain differences between the otherwise closely allied South African and Southern Indian Senonian faunas can only be accounted for by direct communication of some sort between the Natal coast and the seas of Southern Europe. Van Hoepen (56, pp. 43-45) came to the conclusion that the fauna of Pondoland showed the same affinity to the Cretaceous of Northern Africa as to that of India and postulated a direct, uninterrupted coastline between Natal and Egypt, and Spath has noted the number of "Atlantic" elements which occur in the Pondoland and Zululand faunas. The evidence now at hand from Angola, though still lamentably scanty, certainly points to migration through Angola in Upper Senonian times, and therefore is in support of the views put forward some time ago by Kossmat (31, pp. 39-55) but not supported by Woods (60, p. 348). It is concluded, therefore, that the great Campanian transgression, which left deposits in Pondoland, Zululand, Angola, and elsewhere, opened up a sea connecting the Angolan Gulf



with the southern ocean, and thus permitted intermingling of "Atlantic" and "Indo-Pacific" elements in Angola and South-East Africa. The Campanian probably marked the final severance of the southern part of the Brazilio-Ethiopian continent. That the "Atlantic" elements in South-East Africa could have, in part, migrated down the east coast is of course still probable.

One is tempted to suggest that the communication may have been established as early as the Coniacian, following on the Turonian regression (Turonian deposits probably being absent from Angola), but evidence for Coniacian forms on the west coast south of the Cameroons is still lacking.

It is somewhat surprising that Campanian deposits have not been found between Mossamedes and Pondoland. The occurrence reported by Merensky (33, p. 18) of *Protocardia hillana*, *Turritella (Zaria) bonei*, and *T. meadi*, three Pondoland forms, on the south-west African coast south of Bogenfels, would, if substantiated, have a distinct bearing on the question, but Kaiser (30, vol. ii, p. 1) has been unable to confirm the report.

#### DESCRIPTION OF THE SPECIES.

### LAMELLIBRANCHIA.

#### FAMILY ARCIDAE.

Genus TRIGONOARCA, Conrad.

*Trigonoarca angolensis*, sp. nov.

(Plate IV, figs. 1-3.)

*Material*.—Holotype, 6469, an extremely well-preserved right valve. Paratype, 6466.

*Description*.—Shell large, thick, trigonal and oblique, slightly longer than high, well inflated. Anterior margin merging gradually into the rounded, moderately convex, ventral margin; posterior margin straight, forming an acute angle with the ventral margin. Umbonal region much inflated, umbones incurved, with a very well-marked rounded carina extending to the produced postero-ventral angle, slightly concave to the postero-dorsal margin; the part behind the carina sloping very rapidly, almost vertical. Margins of valves



smooth, pallial line entire, with irregular muscle pits on the inner side. Adductor impressions large, subequal, the posterior one on a raised platform. Hinge long, arched, and with numerous teeth, the central short, the lateral longer, with the upper portions bent sharply outwards at or near the middle. Area large, triangular, with seven deep ligament grooves separated by raised ridges of the same width as the grooves; grooves and ridges sharply bent beneath the umbo. Outer surface of both specimens poorly preserved, but showing growth lines of varying strength; radial ornamentation not seen.

Length 75 mm., height along carina 70 mm., height measured vertically from the umbo 63 mm., thickness of one valve 30 mm.

*Remarks.*—This is a very distinct species, most nearly related to *T. capensis* (Griesbach) (60, p. 288, pl. xxxiv, figs. 1, 2) from Pondoland. The latter has a narrower area with fewer, shallower, and more widely spaced ligament grooves, a relatively longer hinge line, and is less massive and oblique.

*Locality.*—Baba district, near Mossamedes.

*Trigonoarca* cf. *diceras* (Seguenza).

(Plate I, fig. 9.)

1882. *Arca diceras*. Seguenza, Atti Accad. Lincei, Roma, ser. 3, vol. xii, p. 158, pl. xiv, fig. 1.  
 1912. *Arca* (*Trigonoarca* ?) *diceras*. Pervinquière, Et. Pal. Tunis, Gastr. et Lam. Crét., p. 102, pl. vii, figs. 23, 25, 26 (with syn.).  
 1915. *Trigonoarca* cf. *diceras*. R. Bullen Newton, Trans. Roy. Soc. Edin., vol. li, pt. iii, p. 570.  
 1918. *Arca* (*Trigonoarca*) *diceras*. Greco, Pal. Italica, vol. xxiv, p. 29, pl. xix, figs. 14, 15 (with syn.).

*Remarks.*—A cast from Camballa of a small *Trigonoarca* resembles this North African Cenomanian species by reason of its elongate, almost quadrangular shape, very prominent incurved and distant umbones placed very anteriorly, high sharp posterior carina extending to the postero-ventral angle. A similar cast from the ammonite marls at Lobito has been referred doubtfully to this species by Bullen Newton.

*Locality.*—4 km. east of Camballa village, Cuvo River, No. 6828.

*Trigonoarca* cf. *trichinopolitensis* (Forbes).

(Plate IV, figs. 8, 9.)

1846. *Arca trichinopolitensis*. Forbes, Trans. Geol. Soc. Lond., vol. vii, p. 150, pl. xv, fig. 16.

1871. *Trigonoarca trichinopolitensis*. Stoliczka, Cret. Pel. S. India, p. 353, pl. xviii, figs. 12, 14 ; pl. xix, figs. 2, 3 ; pl. xx, figs. 2, 8, 10.

*Material*.—One specimen with valves closed, fairly well preserved ; No. 6465.

*Description*.—Shell moderately large, trapezoidal, convex, longer than high. Anterior margin evenly rounded and merging into the rounded ventral margin ; posterior region produced, the postero-dorsal margin almost straight, meeting the ventral margin in a sharp, produced, postero-ventral angle. Umbones anterior, incurved and distant, relatively small ; a pronounced carina, slightly curved and concave to the postero-dorsal margin, extending from the umbones to the postero-ventral angle, dividing the shell into a moderately inflated area and a narrow, steeply descending postero-dorsal region. Hinge moderately long, area and hinge not clearly seen.

Ornamentation near the umbo consisting of numerous concentric ridges crossed by numerous radial ridges, the latter being the stronger ; the radial ridges interrupted towards the ventral part of the shell by irregular laminar concentric growths ; posterior to the carina the concentric ornamentation appears to dominate.

*Remarks*.—Stoliczka has amply figured this species and noted the variation in shape. The Baba specimen resembles very closely the more elongated examples from the Trichinopoli group, but an actual comparison of specimens would be necessary to decide whether it is identical with Forbes' species. The ornamentation is peculiar and appears to be identical with that of the Indian form, in which the radial ribs likewise tend to become obsolete posteriorly.

*T. maresi* Coquand (11, p. 130, and 39, p. 103) from North Africa has a considerable resemblance to this species, as has been pointed out by Pervinquière and others ; in this Coniacian form, however, the radial ornamentation is but poorly developed, whereas in our form the radial ornamentation predominates on the earlier portions of the test.

Woods has drawn attention to the relationship between the Indian species and *T. capensis* (Griesbach), but this species and *T. angolensis*,

described above, can be readily distinguished by their more quadrate outline and more prominent umbonal region.

*Locality*.—Baba district, near Mossamedes.

Genus BARBATIA, Gray.

*Barbatia*?, sp.

(Plate II, fig. 17.)

*Remarks*.—The collection contains a single left valve of a small Arcid which may be referred tentatively to *Barbatia*. The shell is sub-quadrate, longer than high, moderately convex, with rounded margins, and is provided with a well-rounded posterior carina; hinge line long but not the greatest length of the shell; umbo relatively prominent. The surface is ornamented with numerous straight sharp radial ribs which are widely spaced and separated by flattened interspaces; the ribs are closer together behind the carina.

The specimen has the general form of *B. meridiana* Woods (60, p. 287, pl. xxxiii, fig. 14), but the hinge line is relatively longer and the ornamentation quite different. It is preserved on a limestone slab with poor specimens of *Chenopus reineckei* sp. nov. and *Astarte* sp., fragments of fish remains, and numerous foraminifera, among which Mr. W. A. Macfadyen, M.A., has identified *Bigenerina capreolus* d'Orbigny.

*Locality*.—Hills west of well location, Quimbaixie, No. 6821.

Genus NEMODON, Conrad.

*Nemodon natalensis* (Baily).

(Plate IV, fig. 4.)

1855. *Arca natalensis*. Baily, Q.J.G.S., vol. xi, p. 461, pl. xiii, fig. 2.

1904. *Latiarca* (?) *natalensis*. Etheridge, Sec. Rep. Geol. Surv. Nat. and Zul., p. 77, pl. i, figs. 10–12.

1906. *Nemodon natalensis*. Woods, Cret. Fauna of Pondoland, Ann. S. Afr. Mus., p. 289, pl. xxxiv, figs. 3–7.

*Remarks*.—This fine species is represented in the collection by two well-preserved left valves which agree in every detail with the description given by Woods and topotypes in the Sedgwick Museum. The radial ribs anterior to the carina are more widely spaced and irregular in size than in Woods, fig. 5a, but more regular than in the

variety fig. 4, and hence the character of the ornamentation lies between the two. The type is from the Campanian of Pondoland.

*Locality*.—Baba district, north of Mossamedes, Nos. 6467, 6477.

FAMILY PERNIDAE.

Genus INOCERAMUS, J. Sowerby.

*Inoceramus* spp.

*Remarks*.—There are some poor examples of *Inoceramus* in the collection. In this genus, as in the Ostreidae, the great variability of the species makes the identification of specimens from distant localities difficult, and when, as in the present case, only imperfect material is available, the best that can be done is to indicate the species-groups to which the forms belong. The evolution of the English Cretaceous members of the genus has been worked out by Woods (63).

There are two examples from "foot of cliff 2 km. E. of Cabo Ledo" (No. 6825), from which locality fragmentary Cephalopoda have been obtained which, according to Spath (see Haughton, 28, p. 266), are possibly Turonian. One is a small, moderately inflated form, rather equilateral, whose periphery is not clearly shown, but which is higher than long and ornamented with close concentric sulcations and a suspicion of fine radial striae; it recalls forms belonging to the *anglicus-crippsi-labiatus* group, particularly some young forms of *I. crippsi* Mantell. The other specimen from the same locality is flattened and crushed, but may be the same species. The *anglicus-crippsi-labiatus* group ranges from the Albian to the Turonian.

Two specimens from Cabo Ledo (Nos. 6926, 6927), whence Haughton has described Albian ammonites, are in a fragmentary condition and probably flattened by pressure, but are not unlike the preceding.

FAMILY OSTREIDAE.

Genus OSTREA, Linnaeus.

*Ostrea vesicularis*, Lamarck.

(Plate I, fig. 6.)

1806. *Ostrea vesicularis*. Lamarck, Ann. Mus. Hist. Nat., vol. viii, p. 160, and vol. xiv (1809), p. 375, pl. xxii, fig. 3.  
1888. *Ostrea szajnochai*. Choffat, Mat. Strat. Pal. d'Angola, p. 92, pl. v, fig. 18.



1888. *Ostrea vesiculosa*. Choffat, *ibid.*, p. 91, pl. v, figs. 15–17.

1912. *Ostrea vesicularis*. Woods, *Cret. Lam. England*, vol. ii, p. 36, pl. lv, text-figs. 143–182 (with full discussion and synonymy).

*Remarks.*—A single specimen from Camballa belongs to this widespread and variable Upper Cretaceous species, whose variations have been studied by Woods. It is one of the types showing the grypheate trend and left posterior sinus; left valve convex with the umbo prominent and slightly incurved; posterior part of the shell produced and inflated, separated from the rest of the shell by a deep sinus; right valve deeply concave with a raised fold corresponding to the sinus in the left valve; surface smooth. The sinus is deeper than in any figure the writer has seen.

*Ostrea szajnochai* Choffat from Dombe Grande is a high grypheate form with small posterior lobe and cannot be distinguished from some of the specimens figured by Woods.

*O. vesiculosa* Sowerby has been figured by Choffat from the ammonite marls at Catumbella, but his specimens are more likely the more widespread *O. vesicularis*.

*Locality.*—Ridge east of Camballa village, Cuvo River, No. 6862.

#### Genus ALECTRYONIA, Fischer de Waldheim.

##### *Alectryonia* cf. *syphax* (Coquand).

(Plate I, fig. 3.)

1854. *Ostrea scyphax*. Coquand, *Descr. géol. Prov. Const.*, p. 143, pl. iv, figs. 1–4.

1912. *Alectryonia syphax*. Pervinrière, *Et. Pal. Tunis.*, *Gastr. et Lam. Crét.*, p. 203, pl. xiv, figs. 15–18 (with syn.).

*Remarks.*—A single left valve from Camballa is probably *A. syphax* Coquand or perhaps an allied species. Shell very thick, very slightly inflated, sub-equilateral, with a posterior aliform expansion; ligamental area very large; ornamented with about a dozen strong radiating folds. It resembles the figures given by Pervinrière from the Cenomanian of Tunis. *A. dichotoma* Bayle is distinguished, according to Pervinrière, by having in general more numerous, finer, and more freely bifurcating ribs and is a Senonian form.

*Locality.*—Ridge east of Camballa village, Cuvo River, No. 6799.



Genus *EXOGYRA*, Say.

*Exogyra* cf. *conica* (Sowerby).

(Plate I, fig. 18.)

1813. *Chama conica*. J. Sowerby, Min. Conch, vol. i, p. 69, pl. xxvi, fig. 3.  
1909. *Exogyra conica*. R. Bullen Newton, Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 51, pl. xi, figs. 8-10.  
1912. *Exogyra conica*. Woods, Cret. Lam. England, vol. ii, p. 407, figs. 215-242.

*Remarks*.—Three exfoliated specimens are perhaps best compared with *E. conica* (Sowerby). The left valve is well angulated, and in one specimen the umbo is very much incurved and partially free. The right valve is moderately convex, with flattened border.

*Localities*.—Foot of ridge E. of Camballa village, Cuvo River, No. 6818.

E. of N. end of lagoon, Camballa village, No. 6801.

*Exogyra olisiponensis*, Sharpe.

(Plate III, fig. 8.)

1850. *Exogyra olisiponensis*. Sharpe, Q.J.G.S., vol. vi, p. 185, pl. xix, figs. 1, 2.  
1862. *Ostrea overwegi*. Coquand (*non de Buch*), Géol. Pal. S. Const., p. 226, pl. xix, figs. 1-6.  
1905. *Ostrea (Exogyra) olisiponensis*. Choffat, Nouv. Donn. sur la Zone Litt. d'Angola, p. 44, pl. i, figs. 4, 5.  
1911. *Ostrea (Exogyra) olisiponensis*. Woods, Pal. Upper Cret. Nigeria, p. 277, pl. xx, figs. 1-3 (with syn.).  
1912. *Exogyra olisiponensis*. Pervinquière, Et. Pal. Tunis., Gastr. et Lam. Crét., p. 174, pl. xiii, figs. 4, 5, 9 (with syn.).  
1918. *Exogyra olisiponensis*. Greco, Pal. Italica, vol. xxiv, p. 5, pl. xvii, figs. 12-14 (with syn.).

*Remarks*.—A single left valve from Quissama resembles the figure of the holotype and later figures very closely, hence no further description is necessary. It is widespread in the Cenomanian of the Mediterranean region and occurs also in the Turonian of Portugal and

Nigeria. In Angola it has been figured from Dombe Grande in beds of doubtful age. The type is Upper Turonian.

*Locality*.—East of Dondo-Quixinge Road, Quissama, No. 6798.

#### FAMILY TRIGONIIDAE.

Genus TRIGONIA, Bruguière.

*Trigonia* cf. *ethra*, Coquand.

1912. *Trigonia ethra*. Pervinquière, Pal. Tunis., p. 218, pl. xv, figs. 4-7 (with syn.).
1915. *Trigonia crenulata*. Bullen Newton, Trans. Roy. Soc. Edin., vol. li, pt. iii, p. 571, pl. i, fig. 14.
1918. *Trigonia ethra*. Greco, Pal. Italica, vol. xxiv, p. 30, pl. xx, figs. 1-3 (with syn.).

*Remarks*. Three poorly preserved specimens probably belong to this widely spread North African Cenomanian form, rather than to the allied *T. crenulata* Lamarck originally described from France. The relationships of the two species have been discussed by Greco and by Pervinquière; *T. ethra* differs chiefly in having fewer and consequently more widely spaced costae, which are straighter than in *T. crenulata*, and in possessing a less inflated shell. In our specimens the costae are separated by interspaces which are wider than the costae. The specimens agree very well with the figures given by the authors quoted. Bullen Newton (5, p. 571, pl. i, fig. 14) has recorded as *T. crenulata* some casts from Catumbella and from Lobito (where they occur below the ammonite beds) which have the more widely spaced costae of *T. ethra*.

*T. subcrenulata* d'Orbigny described by White (58, p. 70, pl. v, figs. 2, 3) from Brazil has a considerable resemblance to the Angola forms, as Bullen Newton has already remarked.

*Localities*.—Benguella, No. 6420; Uchi district, Nos. 6444, 6453.

#### FAMILY PECTINIDAE.

Genus NEITHEA, Drouet.

*Neithea aequicostata* (Lamarck).

1819. *Pecten aequicostatus*. Lamarck, Anim. sans vert., vol. vi, p. 181.
1912. *Pecten (Neithea) aequicostatus*. Pervinquière, Pal. Tunis., Gastr. et Lam. Crét., p. 135 (with syn.).

1915. *Neithea aequicostata*. Bullen Newton, Brach. and Mollusca from Angola, Trans. Roy. Soc. Edin., vol. li, p. 565, pl. i, figs. 2, 3.

*Remarks*.—A small right valve from Uchi appears to be identical with the specimen from the ammonite marls of Lobito described by Bullen Newton as *N. aequicostata*. The shell is triangular and only slightly ovate, narrowing rapidly towards the somewhat pointed umbo, ornamented with about twenty ribs of more or less equal size; the ears and transverse striations were not seen. The Angola specimens differ from the typical *N. aequicostata* in having a more triangular shape, narrower umbos, and fewer ribs, and in these respects resemble *N. sergipensis* White (58, vol. vii, pl. iii, figs. 6, 7, p. 39) from the same horizon in Brazil, as Bullen Newton has pointed out.

*Locality*.—Uchi district, No. 6459.

*Neithea quinquecostata* (J. Sowerby).

(Plate I, fig. 13.)

1814. *Pecten quinquecostatus*. Sowerby, Min. Conch., vol. i, p. 122, pl. lvi, figs. 4–8.

1903. *Pecten (Neithea) quinquecostatus*. Woods, Cret. Lam. England, vol. i, p. 202, pl. xxxix, figs. 14–17, and pl. xl, figs. 1–5 (with syn.).

1906. *Pecten (Neithea) quinquecostatus*. Woods, Ann. S. Afr. Mus., vol. iv, pl. xxxiv, fig. 14.

1909. *Neithea quinquecostata*. Bullen Newton, Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 58, pl. iii, figs. 1, 2 (with syn.).

*Remarks*.—A damaged and worn right valve from Uchi certainly belongs to this widespread species. There are from four to five subsidiary ribs in each of the interspaces between the main ribs. The species has not previously been recorded from Angola, but occurs throughout the Upper Cretaceous of Europe, North Africa, India, the Campanian of Pondoland, and the Manuan Creek deposits of Zululand. It occurs here in a white limestone with Albian forms.

*Locality*.—Uchi district, No. 6437.

*Neithea tricostata* (Coquand).

(Plate I, figs. 10–12.)

1862. *Janira tricostata*. Coquand, Géol. Pal. S. Const., p. 219, pl. xiii, figs. 3, 4 [non *Pecten tricostatus* Bayle].

1888. *Janira ficalhoi*. Choffat, Mat. Strat. Pal. d'Angola, p. 89, pl. v, figs. 8–10.

1912. *Pecten (Neithea) shawi*. Pervinquière, Et. Pal. Tunis., Gastr. et Lam. Crét., p. 136, pl. ix, figs. 1-6 (with syn.).
1915. *Neithea tricostata*. R. Bullen Newton, Trans. Roy. Soc. Edin., vol. li, p. 567, pl. i, figs. 5-7.
1915. *Neithea angoliensis*. R. Bullen Newton, *ibid.*, p. 566, pl. i, fig. 4.

*Material*.—Numerous large and small specimens. Also two specimens of the variety with reduced intermediary costae.

*Description*.—Shell triangular, nearly equilateral, considerably higher than long, ventral margin polygonal, ears small. Right valve very convex with the umbo greatly incurved; ornamented with twenty-one ribs, six of which are much stronger than the rest and project at the ventral margin; between each of the main ribs are three smaller ribs of more or less unequal size, separated by deep concave interspaces, the central intermediary rib larger than the other two; surface with fine concentric striations. Antero- and postero-dorsal areas sloping downwards or slightly inwards, with a few nearly obsolete ribs and concentric striations.

Left valve slightly concave with more or less equal ribs, six of the furrows being a little deeper than the rest.

*Remarks*.—R. Bullen Newton has described a beautiful and extraordinarily large example of this species from Lobito, but his figure hardly does justice to the specimen. The species, which is widespread in the Cenomanian of North Africa, is often confused with *N. quadrucostata* (Sowerby), as Newton has observed, but differs in several important points; the height is relatively greater and in the right valve the umbo is more strongly incurved; the ears are much smaller; the antero- and postero-dorsal areas slope downwards rather than outwards; the intermediary ribs are usually markedly unequal. There are several large examples in the collection, none of which are as well preserved as that figured by Newton, as well as some small forms which are more like the examples figured by Pervinquière.

*Variety with Costae Reduced*.—*N. tricostata* is interesting on account of the frequently exhibited tendency of the intermediary costae to become reduced. Normally there are three well-developed costae between each of the six major costae, and of these the middle one is greater than the other two. Such normal forms are figured, *e.g.* by Pervinquière (figs. 1-3). The lateral intermediary costae in each group tend to become rudimentary. Pervinquière figures two such varieties (figs. 4-6): the variety *atropha* Peron, in which the lateral intermediary costae nearest the middle line of the valve become



reduced, and the variety *biatropa* Pervinquière, in which the reduction is carried furthest in the lateral intermediary costae most remote from the middle line. In each case the tendency is to leave two rather unequal intermediary costae between each of the six major costae. The degree and manner of the reduction is extremely variable—Pervinquière himself figures an intermediary variety—and in the present state of our knowledge it seems to the writer to be useless to propose varietal names.

There are in the collection two small right valves from Uchi, in excellent state of preservation, which show a considerable reduction of the lateral intermediary costae, and in that respect resemble the variety *atropa*. In shape they are like the typical forms, with narrow, triangular valves, well inflated and strongly incurved at the umbones, smooth and very steep areas, and small ears; they show the concentric striation characteristic of *N. tricostata* but are perhaps narrower and more pointed at the umbones than most examples of the species.

*Janira ficalkoi* Choffat from the *Pholadomya pleuromyaeformis* horizon at Dombe Grande is apparently an extreme case in which one of the three intermediary costae in each group has become reduced to a ridge on the flank of the adjacent major costa. The holotype of *N. angoliensis* R. B. Newton is a worthless specimen from below the ammonite marls at Catumbella, in which the reduced costae are apparently absent owing to the poor state of preservation; in form it agrees almost exactly with the Uchi specimens.

*Localities*.—Ridge E. of Camballa village, Cuvo River, Nos. 6819, 6851; Dombe Grande, No. 6404; Benguella, Nos. 6423, 6428; Uchi district, Nos. 6454, 6455.

Variety with reduced costae: Uchi district, Nos. 6436, 6464.

*Neithea welwitschi* (Choffat).

1888. *Janira welwitschi*. Choffat, Mat. Strat. Pal. d'Angola, p. 90, pl. v, fig. 11.

*Remarks*.—This species was founded on a single large shell from Dombe Grande, characterised by about a dozen large costae with one rather smaller costa between each, and, judging from the figure, of moderate convexity. The species appears to be more closely allied to *N. quadricostata* than to any other species, but the point cannot be decided in the absence of better material. Some shells from Camballa are doubtfully referred to the species.

*Locality*.—Ridge E. of lagoon, Camballa village, Nos. 6864–6866.



## FAMILY SPONDYLIDAE.

Genus *PLICATULA*, Lamarck.*Plicatula*, sp.

(Plate V, figs. 1-3.)

*Remarks.*—Five specimens of *Plicatula*, all with the valves closed, are present in the collection. Owing to the great variability of the species and the extraordinary difficulty in defining them, the writer has been unable to allot definite names to the present specimens. Unless a very large number of specimens were examined it would be extremely hazardous to attempt to assign names to the species or even adequately to describe them, and it would merely add to the confusion already existing. A large number of species have been described from North Africa by Coquand, Peron, Pervinquièrè, and others, and the more recent studies of Pervinquièrè, who has described and given excellent figures of numerous examples, show clearly that the delimitation of the numerous species and varieties is by no means an easy matter. Under the circumstances the writer can do no better than record some of the characters exhibited by the present specimens and indicate some of the previously published figures which they resemble.

The five Angola specimens diverge considerably from one another, though they have certain features in common which lead one to regard them as one and the same species. They are all stout shells, higher than long, with subequal valves, tapering towards the umbones, the longest part of the valves nearer the ventral margin than the umbones; ornamented with numerous very irregular subequal radiating ribs and prominent irregularly spaced growth laminae. The chief variation is in the degree of inflation, which is from slightly convex to moderately convex, and in the number of radiating ribs, which vary from about twenty to over thirty, and appear to increase in the later parts of the valves by dichotomy.

These forms bear a considerable resemblance to the Tunisian species described and figured by Pervinquièrè as *P. ventilabrum* Coquand var. *suffetulensis* Pervinquièrè (39, p. 154, pl. x, figs. 9, 10) and to the more finely costate variety of *P. ventilabrum* (39, pl. x, fig. 11) which are Senonian forms. These varieties are stout inflated forms which taper

towards the umbones and bear from twenty to thirty irregular ribs, interrupted by irregular prominent growth laminae. The var. *suffetuelensis*, however, has fine radiating striae between the costae, which are not seen in the Angola forms (though they may have originally been present).

*P. ferryi* Coquand var. *desjardinsi* Coquand (39, pl. ix, fig. 22), also Senonian, resembles both the above varieties and our specimens closely; it has no finer striae between the costae, a character which is one of the main differences between *P. ventilabrum* and *P. ferryi*, according to Pervinquière indicating evolution from different stocks.

*Locality*.—Massagano area, south of the river, Nos. 6752, 6754.

Genus SPONDYLUS, Linnaeus.

*Spondylus angolensis*, sp. nov.

(Plate II, figs. 9–11.)

*Description*.—Left valve smaller than the right, well inflated, inequilateral, quadrangular in outline. Umbonal region prominent, pointed. Posterior side sloping gently, anterior side with steep slope from a well-rounded ridge which extends from the umbo to the antero-ventral angle. Posterior margin moderately convex, merging gradually into the ventral margin; anterior margin straight, meeting the ventral margin at about a right angle. Margin dentate on the inner side. Ornamented with about thirty stout radiating ribs, sharp at the summit; ribs provided with pointed spines at regular intervals, the spines arranged in concentric rows; ribs separated by deep grooves of about the same width as the ribs. Right valve greatly produced, almost cylindrical.

*Remarks*.—The diagnosis was formed partly from an internal cast of a specimen in which the valves were united, partly from a mould of part of the left valve of the same specimen. In the form of the right valve this species recalls *S. coquandianus* d'Orbigny (14, vol. iii, p. 663, pl. cccclii, figs. 9, 10), a Turonian species, but the quadrangular outline and relatively few ribs easily separate it and point to its being a rather distinct species.

*Locality*.—Dombe Grande, No. 6369.

## FAMILY LIMIDAE.

Genus LIMA, Bruguière.

Sub-genus *Mantellum*, Bolton.*Lima (Mantellum)*, sp.

(Plate IV, fig. 11.)

*Remarks.*—Among the Mossamedes specimens is the left valve of a small *Mantellum* comparable with *L. (Mantellum) elongata* (Sowerby) (61, vol. ii, p. 34, pl. vi, figs. 5-7) from the Chalk. Shell moderately convex, oblong, oblique; antero-dorsal margin long, almost straight, ventral margin rounded. Ornamentation of about fifteen very strong, elevated, laterally compressed, sharp-edged ribs, separated by deep V-shaped furrows.

*Locality.*—Mesados Cavalleros, near Mossamedes, No. 6485.

## FAMILY MYTILIDAE.

Genus LITHODOMUS, Cuvier.

*Lithodomus*, sp.

(Plate III, figs. 5-7.)

*Remarks.*—Shell elongate, cylindrical, very convex; anterior truncated; ventral margin straight; posterior slightly compressed. Umbones moderately inflated, highly incurved and almost touching, terminal. Surface ornamented with concentric growth lines. The above description applies to a small *Lithodomus* which may be compared with *L. aequalis* d'Orbigny (14, vol. iii, p. 295, pl. cccxvi, figs. 4-6) from the Turonian of France, but our form is more perfectly cylindrical, the sides being parallel when viewed from above.

*Locality.*—Mesados Cavalleros, near Mossamedes, No. 6492.

## FAMILY PLEUROMYIDAE.

Genus PLEUROMYA, Agassiz.

*Pleuromya* ?, sp.

(Plate V, fig. 11.)

*Remarks.*—A single right valve from Capolo is referred doubtfully to *Pleuromya*. Shell elongate oval, moderately inflated, inequilateral,

thin; umbo prominent, incurved and anteriorly placed; margins rounded; anterior part short, posterior long and very slightly compressed. Posterior not gaping, or only a little. The surface is ornamented with growth lines and is without punctae.

From the same locality Houghton has recorded *Phylloceras surya* (Forbes), which in India occurs in the Valudayur group, and *Baculites* sp.

*Locality*.—15 km. S., 75 km. E. of Capolo, No. 6786.

FAMILY PHOLADOMYIDAE.

Genus PHOLADOMYA, Sowerby.

*Pholadomya* aff. *tigris*, Noetling.

(Plate V, figs. 7, 8.)

1902. *Pholadomya tigris*. Noetling, Fauna Baluchistan, p. 52, pl. xiii, fig. 6.

*Remarks*.—A damaged and somewhat worn cast of a specimen with the valves closed agrees very well with the figures and description of *P. tigris* from the Maestrichtian of the Mari Hills. The shell is thin, well inflated; umbones anteriorly placed, strongly incurved, the umbonal region well inflated; ornamentation of growth lines and about eighteen radiating folds, which are absent from the anterior and posterior ends of the valves. Noetling states that though the anterior of his specimen is damaged, it appears to have been short and cut off straight; from his figure the shell appears to be truncate anteriorly, but may have been rounded as in our shell, which agrees in other particulars. Compare also *P. esmarki* (Nilsson) (22, vol. ii, p. 272, pl. clvii, fig. 10, and 34, p. 101, pl. xxxiv, fig. 5) which appears to be higher and more oblique.

*Locality*.—Massangano Fort, No. 6767.

FAMILY CYPRINIDAE.

Genus CYPRINA, Lamarck.

*Cyprina*, sp.

(Text-figs. 1, 2.)

*Description*.—Shell very large, highly inflated, ponderous, very inequilateral and oblique. Umbonal regions large, inflated, very



Fig. 1.

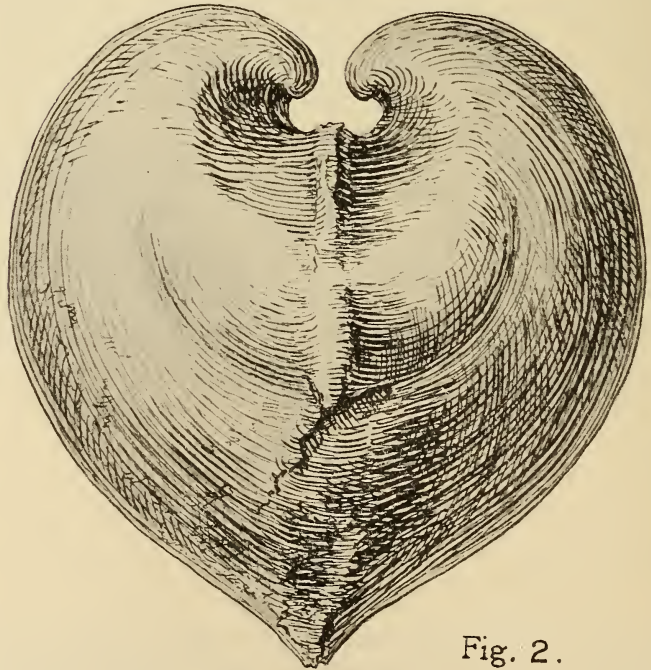
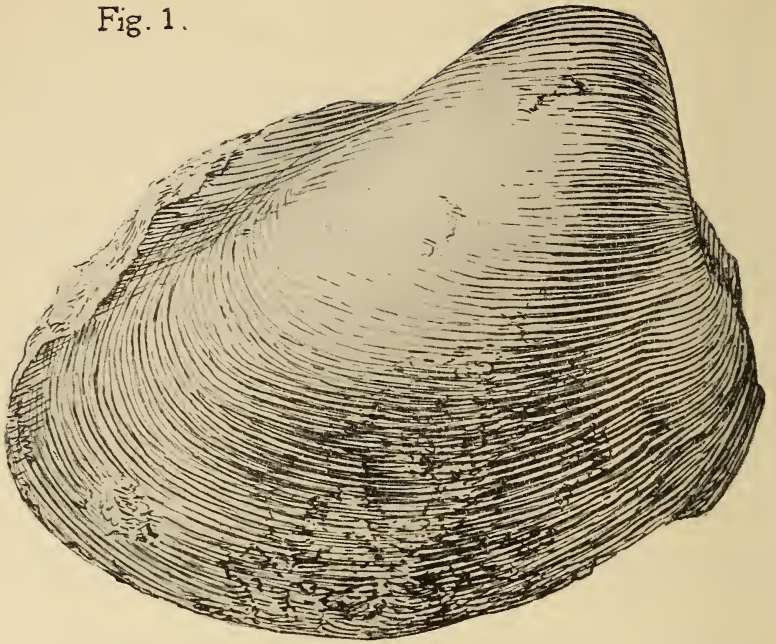


Fig. 2.

FIGS. 1 and 2.—*Cyprina*, sp. Two views of cast from the Quissama area, No. 6824.



anterior; umbones relatively small, highly incurved but not touching. Anterior margin rounded, not produced; posterior of the shell produced, postero-dorsal margin convex, postero-ventral extremity sharply rounded; ventral margin gently convex. Lunular region large, broad, and depressed. Muscular impressions relatively shallow, the anterior large and elongated.

Length 10 cm., thickness 8.5 cm., height 8.5 cm.

*Remarks.*—The description is of a remarkably large internal cast which seems to be a true *Cyprina*. The highly inflated and broad umbonal region, combined with the obliquity and ponderous size, make this a very distinct species. It occurs with the Cenomanian-Turonian *Ex. olisiponensis*.

*Locality.*—East of the Dondo-Quixinge Road, Quissama, No. 6824.

Genus *VENILICARDIA*, Stoliczka.

*Venilicardia* cf. *nicaisei* (Coquand).

(Plate V, figs. 9, 10.)

1862. *Cyprina nicaisei*. Coquand, Geol. Pal. Sud. Const., p. 201, pl. ix, figs. 8–10.

1912. *Cyprina (Venilicardia) nicaisei*. Pervinquière, Pal. Tunis., Gastr. et Lam. Crét., p. 227, pl. xvi, figs. 3–5.

*Material.*—A poorly preserved right valve from Hombo, showing only roughly the general shape and coarse ornamentation; a cast of a right valve and a cast of a specimen with the valves united, with portions of the test adhering, both from Massangano.

*Description.*—Shell triangular, longer than high, very inequilateral, moderately inflated; umbones prominent and placed well forward. Postero-dorsal margin long, convex; ventral margin slightly convex; the posterior part somewhat truncate; antero-dorsal margin short, concave, anterior rounded. Prominent carina extending from the umbones to the postero-ventral extremity, separating a very steep postero-dorsal area from the rest of the shell. Ornamentation of strong concentric ribs, which become finer behind the carina. Muscle impressions very deep, the anterior deeper.

*Remarks.*—The specimens bear a certain resemblance to the North African form in size and proportions, position of the umbo, and strength of the carina, but the ornamentation appears to be coarser.

*C. ligeriensis* d'Orbigny (14, vol. iii, p. 103, pl. cclxxv) from the

Turonian has the umbo placed more anteriorly and the carina less strong. *C. securiformis* Sharpe (46, p. 182, pl. xxii, figs. 1-3) is of the same type but with finer ornamentation.

*Localities.*—Massangano area, south of the river, No. 6758. Near Hombo, Quissama, No. 6759.

#### Genus VENIELLA, Stoliczka.

The group of shells related to Morton's *Venilia conradi* has given rise to much confusion, chiefly owing to the misinterpretation by Stoliczka of Morton's genus *Venilia*. The genus *Venilia* was created by Morton (35, p. 294, pl. viii, figs. 1, 2, and 35a, p. 67, pl. viii, figs. 1, 2) in 1833 for a shell from New Jersey, *V. conradi* Morton, which was characterised by its markedly trigonal shape and incurved umbones. The original description of the genus is meagre—"an equivalve bivalve; the hinge with three robust cardinal teeth in each valve, and an elongated thick lateral on the posterior side, similar to that of a *Unio*; anterior muscular impression profound"—but the figure given of the right valve shows the relative proportions and positions of the teeth sufficiently clearly, though that of the left is too poor to be of much use.

Stoliczka (54, p. 189) in 1871 replaced the name *Venilia* (preoccupied, having been used by Duponchel in 1829 for a group of Lepidoptera and since used also by Alder and Hancock in 1844) by *Veniella*, but at the same time he misunderstood Morton's genus and wrongly characterised *Veniella* as possessing two cardinal teeth and one posterior lateral in each valve. Stoliczka (54, pp. 197-199, pl. ix and pl. x, fig. 1) described three species from India with the same remarkable shape as *V. conradi*. Two of these he referred to *Cyprina* Lamarek, viz. *C. forbesiana* Stol. and *C. cristata* Stol., but Meek (32, p. 150) pointed out some of the characters which separate the former from *Cyprina*, and placed both species (the hinge of the latter not having been seen) in *Veniella*, quoting Conrad in support of his action. Stoliczka himself is inconsistent in calling *C. forbesiana* a *Cyprina*, for he states that a typical *Cyprina* is uniformly convex and that the right posterior cardinal is thick and deeply bifurcate, whereas his description and figures show clearly that *C. forbesiana* is a markedly trigonal, highly carinated shell, with the right posterior cardinal only feebly sulcated above. The third Indian species was placed in a new sub-genus *Cicatrea*, including only *C. cordialis* Stol., a shell which resembles the other forms closely in shape, in the arrangement of the

teeth, and is distinguished, according to Stoliczka, by possessing a short but deeply bifurcate ligament groove; he placed *Cicatrea* provisionally under *Cyprina*.

Further confusion was caused in 1881 when Munier-Chalmas (16, p. 74) created the genus *Roudaireia*, with a Tunisian species *R. drui* as type; he associated *Cyprina forbesiana* and *C. cristata* with his type, but retained *Cicatrea* as he did not find the bifurcate ligament groove in *R. drui*.

Douvillé (15, p. 216) in 1904, in recording *Cicatrea cordialis* from Madagascar, was led to regard *Cicatrea* and *Roudaireia* as synonyms and to reject the former as having been badly defined by Stoliczka, a view which received the support of Pervinquière (39, pp. 228–229) in 1912, who, however, restudied the types of *R. drui* and came to the conclusion that that species does show the deeply bifurcate ligament groove, and hence he accepted the three Indian forms under *Roudaireia*. At the same time Pervinquière remarks on the lack of accord between Morton's original figures, Meek's figures of the holotype of 1876, and Whitfield's figures of 1885 (59, p. 144, pl. xix, figs. 8–10), and implies that, as none of them quite agree with *Roudaireia*, either *Veniella* is badly defined and must give place to *Roudaireia* or is a different genus. Trechmann (55, pp. 58–59) has recently described a *Roudaireia* (*R. jamaicensis*) and a *Veniella* from Jamaica and evidently regards them as distinct.

On the other hand Bullen Newton (4, p. 69) in 1909 regarded *Cyprina forbesiana* and *C. cristata* as belonging to *Veniella*, with which he was inclined to make both *Cicatrea* and *Roudaireia* synonymous. Wade (57, p. 77, pl. xxiv, figs. 14–16) has recently given a lengthy description of *V. conradi* with excellent figures, and it is interesting to note that he includes *R. drui* under *Veniella*.

There can be no doubt that the various species under discussion belong to one and the same genus, which is characterised by its markedly trigonal shape and high carina and by its non-bifid right posterior cardinal, the latter character at once distinguishing it from both *Cyprina* Lamarck and *Venilicardia* Stoliczka. It is not quite clear what Stoliczka had in mind when he stated that *Cicatrea* possessed a short but deeply bifurcate ligament groove, and his figure of a left valve leaves one in some doubt as to its interpretation; the writer has seen an example of *V. forbesiana* in which the nymph has broken away from the shell, leaving two parallel grooves, and it is likely that the diagnosis of *Cicatrea* is based on a similarly imperfect specimen. The delicate lamina connecting the top of the left anterior cardinal

with the base of the left median cardinal, which lamina corresponds to the groove between the right anterior and median cardinals, appears to have been observed only in *V. forbesiana*. That *Veniella* should have precedence over *Roudaireia* is established; the figure of the right valve given by Morton shows clearly enough not only the peculiar shape and ornamentation of the genus, but also the nature and disposition of the teeth, and in particular the non-bifid right posterior cardinal.

*Veniella drui* (Munier-Chalmas).

(Plate III, figs. 2, 3.)

1881. *Roudaireia drui*. Munier-Chalmas, Mission des Chotts Tun., p. 76, pl. iv, figs. 1-7; pl. v, fig. 1.  
 1902. *Roudaireia drui*. Quaas, Overwegischichten, p. 221, pl. xxiv, figs. 20-22.  
 1912. *Roudaireia drui*. Pervinquière, Pal. Tun., Gastr. et Lam. Crét., p. 230, pl. xv, figs. 9-13.  
 1917. *Roudaireia auressensis*. Fortau, Geol. Surv. Egypt, Pal. Ser., No. 3, p. 63 (with syn.).  
 1926. *Veniella drui*. Wade, U.S.G.S. Prof. Paper 137, Fauna Ripley Form. Tenn., p. 77.

*Remarks.*—The collection includes two damaged specimens which can be referred without doubt to this characteristic North African species. One is a right valve whose hinge has been damaged and whose postero-ventral extension has been removed, the other a left valve still retaining the postero-ventral portion. They resemble the figures given by Munier-Chalmas and Pervinquière very closely, and it is not necessary to add anything to the description beyond mentioning that they show very clearly the characteristic ornamentation of broad and irregular sulcations which become less pronounced with the growth of the shell, with growth lines behind the carina, and that the carina is more compressed laterally than in the type. There is a very obscure keel running from the umbo between the carina and the dorsal margin as in the holotype, whereas in Coquand's (8, p. 207, pl. xii, figs. 10, 11) *Trigonia auressensis*, which has been regarded as synonymous by Peron (38, p. 299) and by Fortau, the keel is very marked; they can hardly be the same species.

There are three undescribed right valves in the collection of the Transvaal Museum from Pondoland which are not distinguishable specifically from this species, which has hitherto not been described



from Southern Africa ; it is characteristic of the Campanian and Maestrichtian of North Africa.

*Locality*.—Baba district, north of Mossamedes, Nos. 6470 and 6468.

FAMILY ASTARTIDAE.

Genus ASTARTE, Sowerby.

*Astarte*, sp.

(Plate II, fig. 3.)

*Remarks*.—Three specimens from Quimbaixie are referable to *Astarte* but are too poor for further determination. Shells rounded, somewhat compressed, umbones sub-central and moderate in size, posterior truncate ; surface with distant concentric ribs with sharp raised summits.

*Locality*.—Hills west of well location, Quimbaixie, Nos. 6821, 6822.

*Astarte*, sp.

(Plate II, fig. 5.)

*Remarks*.—A specimen from Chipupo contains numerous moulds of an *Astarte*. The following is a description of a plasticine impression. Shell round, longer than high, moderately inflated ; umbo prominent, anteriorly directed ; lunule large, cordate, distinctly limited by an impressed line ; surface ornamented with distant, sharp, raised, concentric ribs separated by flattened interspaces bearing fine concentric striations.

*Locality*.—Chipupo district, No. 6510.

Genus ERIPHYLA, Gabb.

*Eriphyla* cf. *forbesiana*, Stoliczka.

(Plate III, fig. 4.)

1871. *E. forbesiana*. Stoliczka, Cret. Pal. S. India, p. 181, pl. vi, figs. 14–16.

*Description*.—A single left valve in good state of preservation but with the hinge and lunule somewhat obscure. Shell orbicular, very flat and compressed, the earlier part more inflated ; umbo pointed and

anteriorly curved; lunule must have been very narrow and probably deep; escutcheon absent; ornamentation of numerous sharp, thin, concentric ribs separated by broad interspaces which are very minutely striated.

*Remarks.*—The ornamentation, flat compressed shell, narrow lunule, and lack of escutcheon agree very well with Stoliczka's description of *E. forbesiana* from the Arialyur group, but unfortunately his figures hardly indicate the difference between that species and *E. lenticularis* Goldfuss figured from the same horizon.

*Locality.*—Mesados Cavalleros, near Mossamedes, No. 6488.

#### FAMILY CRASSATELLITIDAE.

##### Genus CRASSATELLITES, Krüger.

###### *Crassatellites*, sp.

(Plate II, fig. 12.)

*Description.*—Shell triangular, moderately inflated, compressed ventrally and posteriorly, with a sharp posterior carina, cutting off a narrow depressed area from the rest of the shell. Anterior well rounded, the margin passing gradually into the curved ventral margin. Postero-dorsal margin long, straight, posterior slightly truncate. Umbo inflated; escutcheon long, narrow; lunule indistinct. Surface with concentric striations.

*Remarks.*—The shell is too poorly preserved to make exact comparison possible, but is of the type of *C. regularis* d'Orbigny and may be compared with *C. pusilla* Coquand (8, p. 198, pl. xi, figs. 12, 13) from the Cenomanian of Algeria.

*Locality.*—Dombé Grande, No. 6373.

###### *Crassatellites*, sp.

(Plate II, fig. 15.)

*Remarks.*—Similar to the above and preserved in the same type of matrix, a highly micaceous sandstone, is a left valve apparently belonging to *Crassatellites*. It is more elongated and posteriorly compressed and less inflated than the preceding, and the somewhat sharp carina separates a fairly wide posterior area. Surface with growth lines.

*Locality.*—Dombé Grande, No. 6372.

FAMILY CARDITIDAE.

Genus *CARDITA*, Bruguière.

*Cardita barroneti*, Munier-Chalmas.

(Plate III, fig. 9.)

1881. *C. baronneti*. Munier-Chalmas, Mission des Chotts Tun., p. 70, pl. xi, figs. 4-8.  
1905. *C. baronneti*. Choffat, Nouv. Donn. sur la Zone Litt. d'Angola, p. 30, pl. i, fig. 2.  
1912. *C. barroneti*. Pervinquière, Et. Pal. Tunis., Gastr. et Lam. Crét., p. 241, pl. xviii, figs. 1-3 (with syn.).

*Remarks.*—A single right valve agrees extremely well with the cotypes figured by Pervinquière. The shell is circular in outline, with the prominent umbo curved forward, and the surface is ornamented with about eighteen stout radial ribs, without tubercles, separated by narrower grooves; ventral margin slightly crenulate on the inside; part of the hinge is visible, showing a stout median cardinal, a long narrow nymph and ligament groove, and probably a small anterior cardinal.

From the Maestrichtian of North Africa and recorded also by Choffat from Dombé Grande.

*Locality.*—Baba district, north of Mossamedes, No. 6482.

FAMILY LUCINIDAE.

Genus *LUCINA* Bruguière.

*Lucina angolensis*, sp. nov.

(Plate I, figs. 1, 2.)

*Description.*—One specimen with the valves closed, tolerably well preserved. Shell sub-orbicular, longer than high, moderately compressed, equivalve; hinge line long, gently arched; postero-dorsal and antero-dorsal margins straight; ventral margin well rounded; the posterior probably slightly truncate but only partly present in the specimen; the posterior and anterior margins meeting the postero-dorsal and antero-dorsal margins respectively in rounded angles. Umbones moderately prominent, almost centrally placed, directed

slightly towards the anterior. Lunule small, deep, elongate; escutcheon narrow, very elongate, with margins raised and sharp. Ornamentation of regularly spaced, narrow, sharp, concentric lamellae, separating very broad flat interspaces with fine concentric striations, the concentric markings bending rather sharply upwards before reaching the antero- and postero-dorsal margins.

*Remarks.*—This fine large *Lucina* resembles *L. fallax* Forbes from the Utatur group of India. The examples regarded as typical by Stoliczka (54, p. 256, pl. xiv, figs. 3–5) differ from our form in several respects; they are shorter, more nearly circular shells with the umbo more anteriorly placed, and the lunule has a more anterior aspect, whereas our form tends to be quadrate and is a much larger shell; the ornamentation appears to be similar.

*L. saharica* Quaas (41, p. 214, pl. xxiv, figs. 5–7) from North Africa is more nearly circular in outline and the main lamellae are closer together. *L. subnumismalis* d'Orbigny (see Ravn, 42, p. 129, pl. iv, fig. 211) is similar to *L. saharica*.

Our shell is most nearly approached by the form described and figured by Woods (62, p. 279, pl. xx, figs. 8, 9) as *Lucina* sp. from the Turonian of Nigeria; the latter is more quadrate than *L. saharica* and in outline and ornamentation resembles our form closely, but differs in being a more inflated and much smaller shell.

There are a number of internal casts from the Chipupo district which are probably *Lucina*, some of which are perhaps this species, as is also a cast from Dombé Grande.

*Localities.*—Dombé Grande; holotype, Nos. 6334, 6337? Chipupo district, Nos. 6501?, 6502?, 6518?, 6519?

*Lucina reinecke*, sp. nov.

(Plate II, figs. 18, 19.)

*Description.*—Shell sub-orbicular, a little longer than high, moderately compressed. Hinge line long, arched. Postero-dorsal margin straight, antero-dorsal gently convex, the two diverging from the umbo at about 120°; anterior, ventral, and posterior margins forming a more or less continuous curve, but the posterior rather straighter than the anterior and giving rise to a slight postero-ventral angle. Umbo small, moderately prominent, anteriorly directed. Lunule and escutcheon obscure or absent. Surface with very numerous sharp concentric ribs of varying strength. Hinge strong, not clearly seen.



*Remarks.*—This species is easily distinguished from the preceding by the irregular nature of the concentric ornamentation. Among European species which are perhaps comparable are *L. sanctae-crucis* Pictet et Campiche (40, sér. iv, p. 289, pl. cxxii, fig. 8) from the Albian, but the latter has a well-defined though narrow escutcheon; *Lucina* sp., figured by Woods (61, vol. ii, p. 152, fig. 3) from the Spilsby Sandstone, has a more completely rounded outline and apparently no trace of a postero-ventral angle. The species is founded on a fairly well-preserved right valve.

*Locality.*—4 km. Mag. N. of Chio, No. 6796.

FAMILY CARDIIDAE.

Genus *CARDIUM*, Linnaeus.

Sub-genus *Trachycardium*, Mörch.

*Cardium (Trachycardium) reynoldsi*, sp. nov.

(Plate III, figs. 10-15.)

*Description.*—The holotype is a well-preserved right valve and is accompanied by three other right valves and one left valve. Shell stout, thick, much inflated, higher than long, inequilateral; umbones prominent, curving strongly inward; anterior margin gently rounded, merging gradually into the ventral margin; posterior margin straight; posterior portion of valve sloping rapidly, the postero-ventral part produced; hinge strongly curved with prominent cardinal and lateral teeth. Adductor impressions not marked. Ornamentation of about twenty-six very strong, much elevated ribs, which are, on the central parts of the valve, very high, with spiny summits, and separated by deep narrow furrows; ribs on the posterior slope lower and more rounded, the change from the large ribs on the central part of the valve to the smaller ribs on the posterior being abrupt, giving the shell an apparent carina; ribs on the posterior part ornamented with large conical tubercles, the outermost ribs having the largest tubercles; ribs on the central part with short spines like the teeth of a saw; on the anterior part the ribs are lower and with conical tubercles; irregular growth lines present. Margins of the valves markedly dentate, especially on the posterior margin.

One of the specimens, apparently an old shell, has a greatly increased height without much increase in length, giving the shell a very inflated and laterally compressed shape.

*Remarks.*—This is a very distinct form belonging to the sub-genus *Trachycardium* and differs from forms like *C. productum* Sowerby and *C. pustulosum* Munster (22, pl. cxliv, fig. 6), which it resembles in shape and size, by having a lesser number of stouter ribs.

*Locality.*—Baba district, north of Mossamedes: holotype, No. 6480; paratypes, Nos. 6471, 6473, 6474, 6481.

*Cardium (Trachycardium ?), sp.*

(Plate II, fig. 4.)

*Remarks.*—The collection includes an incomplete left valve with damaged exterior surface, best included under *Trachycardium* on account of its form. The shell is triangular and very convex and is ornamented with very numerous ribs and furrows. A rather similar lot of shells has been recorded by Bullen Newton as *Trachycardium cf. syriacum* (Conrad) (5, p. 573). Compare with *C. subproductum* Thomas et Peron, regarded as synonymous with *C. productum* Sowerby by Pervinquière (39, p. 259, pl. xix, figs. 25–27), both Turonian forms.

*Locality.*—Catumbella district, No. 6415.

Sub-genus *Acanthocardium*, Gray.

*Cardium (Acanthocardium) denticulatum*, Baily.

(Plate V, fig. 4.)

1855. *Cardium denticulatum*. Baily, Q.J.G.S., vol. xi, p. 460, pl. xiii, fig. 4.

Non. 1871. *Cardium denticulatum*. Griesbach, Q.J.G.S., vol. xxvii, p. 67, pl. iii, fig. 12.

1906. *Cardium denticulatum*. Woods, Ann. S. Afr. Mus., vol. iv, p. 306, pl. xxxvi, fig. 2, and pl. xxxvii, figs. 1, 2.

*Description.*—An incomplete right valve. Shell stout, oval, inflated; umbones median, prominent, and curving strongly inward; posterior side of valve sloping rather more rapidly than the anterior; margins absent in the specimen and hence the characteristic tooth-like projections not seen. Ornamentation of about twenty-six strong, very elevated ribs with spinose summits, separated by deep furrows which are broader than the ribs; ribs closer together and less spiny on the posterior part.

*Remarks.*—This specimen cannot be distinguished from the well-known form from the Campanian of Pondoland; it agrees well with

the description and figures given by Woods, and differs from a specimen in the Sedgwick Museum only in its slightly smaller size.

*Locality*.—Massangano Fort, No. 6766.

Sub-genus *Laevicardium*, Swainson.

*Cardium* (*Laevicardium* ?), sp.

(Plate II, figs. 1, 2.)

*Description*.—Shell trigonal, moderately oblique, inflated, higher than long. Umbones prominent, pointed, touching, directed somewhat anteriorly, with a rounded ridge extending to the postero-ventral angle on each valve; behind the ridge is a narrow, steeply sloping area. Margins gently convex, with rounded postero- and antero-ventral angles. Surface smooth, with very faint traces of growth markings.

*Remarks*.—From its shape and lack of ornament this shell would appear to be a *Laevicardium*. Coquand (8, pls. x, xi) has figured and given new specific names to several casts from Algeria; of these *C. pauli* (*ibid.*, p. 204, pl. x, figs. 5, 6), though a larger shell, appears to have the same form as our specimen, but the concentric ornamentation is more in evidence.

*Locality*.—Dombe Grande, No. 6330.

Genus *PROTOCARDIA*, Beyrich.

*Protocardia hillana* (J. Sowerby).

(Plate III, fig. 1.)

1813. *Cardium hillanum*. J. Sowerby, Min. Conch., vol. i, p. 41, pl. xiv, upper fig.

1904. *Protocardium hillanum* var. *umkwelanensis*. Etheridge, Sec. Rep. Geol. Surv. Nat. and Zulul., p. 79, pl. i, fig. 16.

1906. *Protocardia hillana*. Woods, Cret. Fauna Pondl., Ann. S. Afr. Mus., vol. iv, p. 307, pl. xxxvii, fig. 6.

1908. *Protocardia hillana*. Woods, Cret. Lam. Eng., vol. ii, p. 197, pl. xxxi, fig. 6, and pl. xxxii, figs. 1-6 (with syn.).

1909. *Protocardia hillana*. Bullen Newton, Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 76, pl. v, fig. 16 (with syn.).

*Remarks*.—A poorly preserved left valve of this ubiquitous species is present in the collection. The concentric ornamentation appears

to have been coarse as in the Pondoland examples. The species occurs in the Cenomanian, Turonian, and Senonian of Europe, Cenomanian of North Africa, Senonian of Pondoland, Zululand, and elsewhere.

*Locality*.—Near Hombo, Quissama, No. 6827.

#### FAMILY VENERIDAE.

#### Genus CYPRIMERIA, Conrad.

*Cyprimeria* ?, sp.

(Plate V, fig. 6.)

*Description*.—Shell rounded, oval, moderately convex, length a little greater than height, inequilateral. Antero-dorsal margin short, very slightly convex, passing gradually into the well-rounded anterior margin; postero-dorsal margin long, gently convex, the posterior missing in the specimen. Umbones moderate, close together, anteriorly curved, in front of which is a somewhat depressed area but no defined lunule. Ornamentation of fine concentric striae, some stronger than others.

*Remarks*.—This shell probably belongs to *Cyprimeria* and may be compared with *C. analoga* (Forbes) (54, p. 178, pl. v, figs. 21–23) from the Trichinopoli group of India, which it resembles rather closely. There is an undescribed shell in the Pondoland collection of the Transvaal Museum with which it is very probably identical, but the state of preservation of the Angola shell prevents a definite decision.

*Locality*.—Massangano area, south of the river, No. 6750.

*Cyprimeria* ?, sp.

(Plate II, figs. 13, 14.)

*Remarks*.—From Dombe Grande comes a small left valve referred tentatively to *Cyprimeria*. It is preserved in the same matrix as *Crassatellites* spp. from the same area. The shell is oval, long, and somewhat compressed, the umbo moderately prominent and in front of the middle, and the badly worn surface was probably ornamented only with growth markings. The hinge is fairly strong and appears to be provided with two diverging cardinals, a long, very thin, posterior cardinal flanking the nymph, and an anterior lateral of moderate length. The shell is obscurely carinated near the postero-dorsal border.

*Locality*.—Dombe Grande, No. 6374.



Genus MACROCALLISTA, Meek.

*Macrocallista* ?, sp.

(Plate V, fig. 5.)

*Remarks.*—The Senonian Ammonoidea of the Carimba localities are accompanied by an indeterminable *Inoceramus* (6835) and imperfect specimens of a small Venerid. The latter are oval shells, longer than high and moderately convex, ornamented with fine concentric striations. These resemble *Meretrix euglypha* Woods (60, p. 305, pl. xxxvi, figs. 7–10) from the Senonian of Pondoland, but the ornamentation is finer.

*Locality.*—Ridge 1300 m. W., 250 m. S. of well-rig, Carimba Camp, No. 6838. Possibly also “Map 65, 8E, Angola,” No. 6877.

Genus BARODA, Stoliczka.

*Baroda* ?, sp.

(Plate II, fig. 20.)

*Description.*—Shell oblong, much longer than high, moderately inflated, very inequilateral, expanded posteriorly. Ventral margin broadly convex; anterior margin short and well rounded; postero-dorsal margin long; posterior produced, with well-rounded margin. Umbones small, incurved, approximate, placed very anteriorly, with a small cordate lunular depression in front of them, not limited by an impressed line. Ligament long and prominent, escutcheon obscure. Surface ornamented with strong concentric striations.

*Remarks.*—The specimen possesses closed valves and hence the determination cannot be accurately made; the surface is for the most part considerably damaged. The external features justify comparison with Stoliczka's *Baroda*, founded for two Indian species (54, pp. 167, 168), or possibly with *Tapes*.

*Locality.*—3½ km. S., 2 km. N. of Chio, No. 6775a.

*Baroda* ??, sp.

(Plate II, fig. 16.)

*Description.*—Shell oval, oblique, longer than high, moderately inflated. Umbones small, anteriorly directed, incurved, touching;

umbonal region fairly prominent. Postero-dorsal margin long, straight. Posterior produced, postero-ventral angle well rounded. Anterior short, the anterior margin rounded and merging gradually into the slightly convex ventral margin. Lunule? Escutcheon absent or indistinct; ligament moderately long and fairly thick. An obscure, very much rounded carina extends postero-ventrally from the umbones. Surface with strong, high, sharply crested and laterally compressed, concentric ribs, separated by deep furrows of about the same width as themselves.

*Remarks.*—This is a well-preserved shell with the valves closed, hence in the absence of the hinge the generic position is uncertain. There is a mould of a right valve of the same species from Muscima. The ornamentation is very striking; ribs of a similar type are seen in a new species of *Macrocallista* from Pondoland to be described shortly, allied to *M. unzambiensis* Woods (60, p. 304, pl. xxxvi, figs. 4–6).

*Localities.*— $3\frac{1}{2}$  km. S., 2 km. N. of Chio, No. 6775*b*; Muscima, No. 6776.

#### FAMILY TELLINIDAE.

Genus TELLINA, Linnaeus.

Sub-genus *Palaeomoera*, Stoliczka.

*Tellina* (*Palaeomoera* ?), sp.

(Plate IV, fig. 7.)

*Remarks.*—Attached to a specimen of *Trigonoarca angolensis* is a right valve which from its shape and peculiar ornamentation should probably be referred to *Palaeomoera*. Shell oblong, longer than high, posterior side shorter than the anterior, margins rounded. Umbo small, directed slightly towards the anterior. Ornamentation on the posterior of radiating ribs, on the central and anterior of faint spaced radiating striae, the whole crossed by growth lines giving the posterior ribs a roughened or serrated appearance. This shell is probably closely allied to, perhaps identical with, an undescribed Pondoland example in the collection of the Transvaal Museum.

*Locality.*—Baba district, near Mossamedes, No. 6466.

## GASTROPODA.

### FAMILY NERITIDAE.

Genus *NERITA*, Linnaeus.

*Nerita malheiroi*, Choffat.

(Plate I, figs. 14, 15.)

1888. *Nerita malheiroi*. Choffat, Mat. Strat. Pal. d'Angola, p. 82, pl. iv, fig. 10.

*Remarks*.—*Nerita malheiroi* is known from sixteen internal casts in good preservation from the *Pholadomya pleuromyaeformis* beds below the ammonite horizon at Dombe Grande. The short description given by Choffat includes the statement that the species appears to have been smooth. Our specimen from Uchi has the form and size of the Dombe Grande species but is in a different state of preservation, for portions of the shell are present. The thin outer layer of the test is almost smooth but with faint transverse striae and with the original colour-markings of the shell still showing as irregular brownish patches; the inner portion of the shell has probably been removed, and a cast of the inner surface of the thin outer layers shows well-marked transverse striae.

There is a small *Nerita* from Dombe Grande with a similar form to that of *N. malheiroi* whose worn surface shows traces of growth lines which may also be this species, and there is a cast of a *Nerita* in a bituminous sandstone from Lifune River in the Loanda province which compares favourably with the type.

*Localities*.—Uchi district, No. 6450; Dombe Grande, No. 6379?; Lifune Seep, Lifune River, No. 6867.

*Nerita angolensis*, sp. nov.

(Plate V, fig. 12.)

*Description*.—Shell moderately large, sub-globose, somewhat flattened posteriorly, consisting of about three whorls; spire small, lateral, almost flat; last whorl very large, inflated, flattened posteriorly, rounded above, not concealing the spire; aperture not seen; ornamentation of prominent transverse ribs which represent the expanded edge of the outer lip at successive growth stages, the

ribs crenulate, the raised portions tending to follow radial lines, especially on the upper part of the whorls.

*Remarks.*—This fine species is founded on a single specimen in which the aperture and ventral portion were not seen. It seems to be closely related to but quite distinct from *N. rugosissima* Forbes (53, p. 342, pl. xxv, fig. 6) from the Aialyur group of India, a smaller species with a slightly higher spire and a rather less flattened posterior, while the ornamentation consists of more widely spaced ribs.

*Locality.*—Massangano area, south of the river : holotype, No. 6839.

#### FAMILY NATICIDAE.

##### Genus GYRODES, Conrad.

##### *Gyrodex cf. genti* (J. Sowerby).

(Plate II, fig. 7.)

1816. *Helix gentii*. J. Sowerby, Min. Conch., vol. ii, pl. cxlv.

1843. *Natica gaultina*. d'Orbigny, Pal. Franç. Terr. Crét., p. 156, pl. clxxiii, figs. 3, 4.

1912. *Natica (Gyrodex) gaultina*. Pervinquière, Et. Pal. Tunis., p. 47 (with syn.).

1925. *Natica (Gyrodex) genti*. Cox, Ann. Transv. Mus., vol. xi, p. 203, pl. xxxviii, fig. 8 (with syn.).

*Remarks.*—Four specimens from Dombe Grande in the condition of casts are very similar to this well-known, variable, and widespread Albian species; they are large shells having the proportions of numerous examples from the Gault of Folkestone in the Sedgwick Museum, with open umbilicus and the posterior portion of the whorls well depressed near the suture. Faint transverse striations are retained in one specimen. A discussion of the synonymy and variations of this species has recently been given by Cox (13, p. 204); the Angola forms differ from that of Portuguese East Africa described by Cox in having broad and deep canals bordering the sutures.

*Natica feioi* Choffat (6, p. 81, pl. iv, fig. 9), described from two specimens from the *Pholadomya pleuromyaeformis* horizon at Dombe Grande, appears to differ in having a more expanded outer lip and smaller umbilicus.

*Localities.*—Dombe Grande, Nos. 6341, 6349, 6361, 6365; Chipupo district, No. 6503.



FAMILY TURRITELLIDAE.

Genus TURRITELLA, Lamarck.

Sub-genus *Haustator*, Montfort.

*Turritella* (*Haustator* ?) cf. *acanthophora*, Müller.

(Plate IV, fig. 13.)

1851. *T. acanthophora*. Müller, Mon. Aachener Kreide, ii, p. 32, pl. iv, fig. 5.  
1887. *T. acanthophora*. Holzapfel, Moll. Aachener Kreide, Palaeontographica, xxxiv, p. 156, pl. xvi, figs. 9, 10, 12.  
1912. *T. (Haustator) acanthophora*. Cossmann, Pal. Comp., vol. ix, p. 117.

*Remarks*.—A large imperfectly preserved *Turritella* has a very strong resemblance to the figures given by Holzapfel of this species from the Maestrichtian of Aachen, which has been placed by Cossmann in the sub-genus *Haustator* Montfort. The specimen is crushed and worn and the transverse striation is not shown, but the gently convex whorls and ornamentation of four widely spaced spiral ribs bearing coarse tubercles strongly recalls the Aachen species, which is of the same size and proportions.

*Locality*.—Baba district, north of Mossamedes, No. 6472.

*Turritella*, sp.

(Plate IV, fig. 14.)

*Remarks*.—An imperfect and worn *Turritella* from Mossamedes is figured here.

*Locality*.—Mesados Cavalleros, near Mossamedes, No. 6487.

FAMILY CERITHIIDAE.

Genus CERITHIUM, Bruguière.

*Cerithium*, sp.

(Plate IV, fig. 6.)

*Remarks*.—The Mossamedes Gastropoda include one specimen which may be referred to *Cerithium*, using the term in the widest sense. The whorls are moderately inflated and divided into two areas

by a sharp angulation towards the posterior side, the area behind the angulation being concave and descending rapidly to the impressed suture; spiral striation can just be recognised.

*Locality.*—Mesados Cavalleros, near Mossamedes, No. 6493.

FAMILY PROCERITHIIDAE.

Genus METACERITHIUM, Cossmann.

*Metacerithium trimonile* (Michelin).

(Plate I, figs. 4, 5.)

1838. *Cerithium trimonile*. Michelin, Mém. Soc. Géol., vol. iii, p. 100, pl. xii, fig. 5.  
 1842. *Cerithium trimonile*. d'Orbigny, Pal. Franç. Terr. Crét., vol. ii, p. 369, pl. ccxxx, figs. 7-9.  
 1906. *Metacerithium trimonile*. Cossmann, Paléoconch. Comp., vol. vii, p. 54, pl. vi, figs. 29-31.

*Description.*—Shell conical, turriculate, with a spiral angle of about  $28^{\circ}$ , spire made up of flattened whorls with shallow sutures; whorls ornamented with two spiral rows of tubercles, the posterior series being the smaller and situated close to the suture, the anterior series larger and forming a ridge situated at some little distance from the suture; in addition, the whorls are ornamented with faint spiral and transverse striations; base rather flattened, merging with a well-rounded angle into the last whorl, ornamented with marked transverse striations. Aperture not seen.

*Remarks.*—The species is common in the Albian of Europe and has been made the genotype of *Metacerithium* by Cossmann. There appears to be considerable variation in the arrangement of the tubercles, for d'Orbigny's specimens have three rows of tubercles, of which, however, the anterior is the greatest. The description given by Cossmann of forms from the same area indicate that there is great variability in this respect, for the middle row may be feeble or absent. Four more or less damaged specimens from the Cuvo River area, all of which retain well-preserved portions of the test, agree with Cossmann's figures in having only two rows of tubercles. Of numerous specimens in the Sedgwick Museum from the Gault of Folkestone the majority have the middle row of tubercles developed, but forms with only two rows are present and these our specimens resemble closely.

The species from the Arialyur group of India described by Stoliczka as *C. trimonile* (53, p. 199, pl. xv, fig. 9, and pl. xix, figs. 2, 3) is probably another species, as Cossmann has remarked, for the tubercles, arranged in three spiral rows, almost form transverse ribs.

*M. mosense* Buvignier (40, sér. iii, p. 293, pl. lxxi, fig. 11) from the Cenomanian has three rows of tubercles of which the posterior is the most prominent, while in *M. ornatissimum* Deshayes (40, sér. iii, p. 290, pl. lxxi, fig. 10) from the Albian the posterior row of tubercles is stronger than the anterior.

*Locality*.—Caputo Hills, Cuvo River, No. 6887.

FAMILY CHENOPIIDAE.

Genus CHENOPUS, Philippi.

[=*Aporrhais*, da Costa.]

*Chenopus (Drepanochilus) reineckei*, sp. nov.

(Plate II, fig. 8.)

*Description*.—Shell of moderate size; spire of five whorls, the earlier convex and evenly rounded; the last whorl angular owing to the development of two prominent carinae separating the whorl into a wide posteriorly sloping portion, a narrow flattened median portion, and flattened base; sutures deep and sutural angle small; surface apparently smooth; anteriorly produced into a short canal; outer lip produced into a wide wing-like expansion with rounded end and without digitiform extensions; the posterior portion of the outer lip retracted, concave to the aperture and sharply upturned at its margin.

*Remarks*.—The nature of the posterior portion of the outer lip and the absence of digitation place this species in Meek's section *Drepanochilus* (32, p. 324), which is placed under *Chenopus* by Cossmann (12, vol. vi, p. 75). The absence of ornamentation readily distinguishes this from other species, except *Chenopus coquandi* Cossmann (12, vol. vi, p. 76, footnote) (= *C. simplex* (Coquand)), which, however, has the wing differently shaped. The retraction and upturning of the posterior portion of the outer lip is seen in the Eocene *C. decoratus* (Locard) figured by Cossmann (12, vol. vi, pl. viii, figs. 7, 8), but the latter has tubercles on the carina.

*Localities*.—16 km. W., 4 km. S. of Mumbondo, No. 6771; hills west of well location, Quimbaixie, Nos. 6821, 6823.

*Chenopus*, sp.

(Plate I, fig. 19.)

*Remarks.*—Two imperfect specimens resemble some species of this genus. Shell moderately large, last whorl rather larger than half the height, aperture elongate, outer lip missing; whorls moderately convex, without carination, sutures well marked, whorls about twice as broad as high; ornamentation of numerous flexuous costae which are slightly concave towards the aperture and crossed by numerous fine spiral striae; a few tubercles developed along the posterior portion of the whorls; anteriorly produced into a canal, basal portion ornamented only with spiral striae.

In the ornamentation there is a resemblance to *Aporrhais* (*Drepanochilus*) *calcaratus* (Sowerby) (Cossmann, **12**, vol. vi, p. 75, pl. iv, fig. 10, and pl. v, figs. 1, 2, 14), but it is readily distinguished by the absence of carination. Cox (**13**, p. 206, pl. xxxviii, figs. 4, 5) has recorded a smaller but similar species from the Albian of Catuane, Portuguese East Africa, as *Chenopus* (*Arrhoges* ?) sp., but the latter has a smaller spiral angle and more convex whorls.

*Locality.*—Catumbella, Nos. 6417, 6418.

## FAMILY STROMBIDAE.

## Genus STROMBUS, Linnaeus.

*Strombus* ?, sp.

(Plate IV, fig. 12.)

*Remarks.*—This small shell has quite the form of some young examples of *Strombus* ? *incertus* (d'Orbigny) (**39**, p. 27, pl. 11, figs. 19, 20) figured by Pervinquière from the Cenomanian of Tunis, but differs in the absence of spiral folds. The surface is delicately sculptured with growth lines.

*Locality.*—Mesados Cavalleros, near Mossamedes, No. 6484.



FAMILY COLUMBELLINIDAE.

Genus PTERODONTA, d'Orbigny.

*Pterodonta* cf. *inflata*, d'Orbigny.

(Plate II, fig. 6.)

1842. *Pterodonta inflata*. d'Orbigny, Pal. Franç. Terr. Crét., vol. ii, p. 318, pl. ccxix.

1904. *Pterodonta inflata*. Cossmann, Paléoconch. Comp., vol. vi, p. 116, pl. viii, figs. 10–12.

*Remarks*.—Two large but imperfect specimens from Uchi resemble very closely the excellent figures given by Cossmann of this species, the type of which comes from the French Cenomanian. Both specimens exhibit traces of the varices, but the apertural regions are damaged and hence the possibility of the forms belonging to *Tylostoma* is not excluded; the resemblance to Cossmann's figures is, however, extraordinarily close.

*Locality*.—Uchi district, Nos. 6439, 6442.

*Pterodonta* aff. *elongata*, d'Orbigny.

(Plate I, figs. 7, 8.)

1842. *Pterodonta elongata*. d'Orbigny, Pal. Franç. Terr. Crét., vol. ii, p. 316, pl. ccxviii, fig. 2.

1904. *Pterodonta elongata*. Cossmann, Paléoconch. Comp., vol. vi, p. 117.

*Remarks*.—Three well-preserved casts from near Mumbondo in the Loanda embayment resemble this form in shape and possess a ridge at each half-revolution due to the periodic dilation of the outer lip and corresponding in position to the internal varices, while the aperture is notched or sub-canalicate anteriorly; they thus belong to d'Orbigny's genus and not to *Tylostoma* Sharpe (45) which is holostomatous. Cossmann (12, vol. vi, p. 116) has shown that the genera are distinct. The present specimens have the posterior portion of the outer lip expanded backwards as in d'Orbigny's figure, but the anterior canalicate parts of the shells are too damaged to show whether the short canal was twisted or not.

*Locality*.—9½ km. W., 1½ km. N. of Mumbondo, No. 6769.

## FAMILY FUSIDAE.

Genus CRYPTORHYTIS, Meek.

*Cryptorhytis* cf. *bleicheri* (Thomas and Peron).

(Plate V, fig. 13.)

*Remarks.*—A rather large cast from Massangano appears to belong to Meek's genus *Cryptorhytis* and resembles *C. bleicheri* (Thomas and Peron) (39, p. 70, pl. v, figs. 12–15) as figured by Pervinquièrè and also *C. reynesi* (Coquand) (8, p. 188, pl. v, fig. 14), both Lower Senonian forms. The columellar folds are barely suggested by small projections within the aperture.

*Locality.*—Massangano area, south of the river, No. 6757.

Genus FUSUS, Lamarck.

*Fusus* ?, sp.

(Plate IV, fig. 15.)

*Remarks.*—The Mossamedes Gastropoda include portions of three whorls of a fusiform shell which may be placed here tentatively. The spiral angle is very approximately 60°; the whorls are convex, carinated a little in front of the middle, and ornamented with distant spiral ribs.

*Locality.*—Mesados Cavalleros, near Mossamedes, No. 6485.

## FAMILY CONIDAE.

Genus CONUS, Linnaeus.

*Conus* ?, sp.

(Plate IV, fig. 10.)

*Remarks.*—Internal cast, probably referable to *Conus*. From Mesados Cavalleros, near Mossamedes, No. 6490.

FAMILY ACTAEONIDAE.

Genus ACTAEON, Montfort.

*Actaeon* ?, sp.

(Plate IV, fig. 5.)

*Remarks.*—Among the poor Gastropoda from Mossamedes is one which can be regarded as an *Actaeon* or possibly a *Tornatellaea*. The spire and part of the last whorl are visible, the whorls of the spire being rather convex, the spiral angle about 60°. The spiral ribs are elevated and separated by interspaces wider than themselves.

*Locality.*—Mesados Cavalleros, near Mossamedes, No. 6489.

FAMILY RINGICULIDAE.

Genus AVELLANA, d'Orbigny.

*Avellana incrassata* (Sowerby).

(Plate I, figs. 16, 17.)

1817. *Auricula incrassata*. J. Sowerby, Min. Conch., vol. ii, pl. clxiii, figs. 1-3.  
1853. *Avellana incrassata*. d'Orbigny, Pal. Franç. Terr. Crét., vol. ii, p. 133, pl. clxviii, figs. 13-16.  
1909. *Avellana* cf. *incrassata*. R. Bullen Newton, Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 30, pl. viii, figs. 6-8.  
1925. *Avellana incrassata*. Cox, Ann. Transv. Mus., vol. xi, p. 207, pl. xxxviii, fig. 7.

*Remarks.*—The collection contains a single specimen which appears to be identical with the Blackdown species. Though far from being perfect, the apertural region exhibits traces of the columellar folds. The axial elements of the sculpture are not evident on the specimen, but the narrow spiral ribs and furrows agree exactly with specimens from Blackdown. In South Africa the species has been recognised by R. B. Newton in the Manuan Creek (Albian) of Zululand and by Cox from Portuguese East Africa.

*Locality.*—4 km. Mag. N. of Chio, No. 6797.

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EXPLANATION OF PLATES.

PLATE I.

*Albian Fossils from Angola.*

The figures are of natural size unless otherwise stated.

FIG.

1. *Lucina angolensis* sp. nov. Right valve of holotype, from Dombe Grande, No. 6334, p. 31.
2. *Lucina angolensis* sp. nov. Dorsal view of holotype.
3. *Alectryonia* cf. *syphax* (Coq.). Left valve from Camballa village, Cuvo River, No. 6799, p. 14.
4. *Metacerithium trimonile* (Mich.). From Caputo Hills, Cuvo River, No. 6887, p. 42.
5. *Metacerithium trimonile* (Mich.). Detail of ornamentation of part of same specimen.  $\times 3$ .
6. *Ostrea vesicularis* Lam. Lower valve from Camballa village, Cuvo River, No. 6862, p. 13.
7. *Pterodonta* aff. *elongata* d'Orb. Cast from near Mumbondo, No. 6769 (Albian ?), p. 45.
8. *Pterodonta* aff. *elongata* d'Orb. Another view of same.
9. *Trigonoarca* cf. *dicerus* (Seg.). Right valve of cast from Camballa village, Cuvo River, No. 6828, p. 10.
10. *Neithea tricostata* (Coq.). Right valve from Uchi, No. 6455, p. 17.
11. " " " Variety from Uchi, No. 6464.
12. " " " Detail of ornamentation at ventral margin of same specimen as fig. 11, No. 6464.  $\times 3$ .
13. *Neithea quinquecostata* (Sow.). Right valve from Uchi, No. 6437, p. 17.
14. *Nerita malheiroi* Choffat. From Uchi, No. 6450, p. 39.
15. " " " Detail of ornamentation on dorsal surface of same specimen.  $\times 2$ .
16. *Avellana incrassata* (Sow.). Apertural view of specimen from Chio, No. 6797 ; the columellar folds have been emphasised by the artist to indicate their position, p. 47.
17. *Avellana incrassata* (Sow.). Another view of same.
18. *Exogyra* cf. *conica* (Sow.). Left valve from Camballa village, Cuvo River, No. 6818, p. 15.
19. *Chenopus* sp. From Catumbella, No. 6418, p. 44.

PLATE II.

*Albian Fossils from Angola.*

The figures are of natural size unless otherwise stated.

1. *Cardium* (*Laevicardium* ?) sp. Left valve of specimen from Dombe Grande, No. 6330, p. 35.
2. *Cardium* (*Laevicardium* ?) sp. Anterior view of same specimen.

## FIG.

3. *Astarte* sp. Left valve from near Quimbaixie, No. 6821 (Albian ?), p. 29.
4. *Cardium* (*Trachycardium* ?) sp. Left valve from Catumbella, No. 6415, p. 34.
5. *Astarte* sp. Left valve from Chipupo (plasticine impression of mould), No. 6510, p. 29.
6. *Pterodonta* cf. *inflata* d'Orb. Cast from Uchi, No. 6439, p. 45.
7. *Gyrodontes* cf. *genti* (Sow.). Cast from Dombe Grande, No. 6365, p. 40.
8. *Chenopus* (*Drepanochilus*) *reinecke*i sp. nov. Holotype, from near Mumbondo, No. 6771 (Albian ?), p. 43.
9. *Spondylus angolensis* sp. nov. Left valve of holotype, from Dombe Grande, No. 6369, p. 21.
10. *Spondylus angolensis* sp. nov. Anterior view of holotype.
11. " " sp. nov. Mould of surface of left valve of holotype.
12. *Crassatellites* sp. Left valve from Dombe Grande, No. 6373, p. 30.
13. *Cyprimeria* ? sp. Left valve from Dombe Grande, No. 6374, p. 36.
14. " sp. Hinge of same specimen.  $\times 1\frac{1}{2}$ .
15. *Crassatellites* sp. Left valve from Dombe Grande, No. 6372, p. 30.
16. *Baroda* ?? sp. Left valve of specimen from near Chio, No. 6775b, p. 37.
17. *Barbatia* ? sp. Left valve from near Quimbaixie, No. 6821.  $\times 2\frac{1}{2}$ . (Albian ?), p. 12.
18. *Lucina reinecke*i sp. nov. Right valve from near Chio, holotype, No. 6796, p. 32.
19. *Lucina reinecke*i sp. nov. Dorsal view of the holotype.
20. *Baroda* ? sp. Right valve of specimen from near Chio, No. 6775a, p. 37.

## PLATE III.

*Senonian Fossils from Angola.*

The figures are of natural size unless otherwise stated.

1. *Protocardia hillana* (Sow.). Left valve from near Hombo, Quissama, No. 6827, p. 35.
2. *Veniella drui* (Mun.-Chalmas). Right valve from the Baba district, near Mossamedes, No. 6470, p. 28.
3. *Veniella drui* (Mun.-Chalmas). Dorsal view of same specimen.
4. *Eriphyla* cf. *forbesiana* Stol. Left valve from Mesados Cavalleros, near Mossamedes, No. 6488, p. 29.
5. *Lithodomus* sp. Dorsal view of specimen from Mesados Cavalleros, near Mossamedes, No. 6492, p. 22.
6. *Lithodomus* sp. Anterior view of same specimen.
7. " sp. Right valve of same specimen.
8. *Exogyra olisiponensis* Sharpe. Lower valve from east of the Dondo-Quixinge road, Quissama, No. 6798 (L. Senonian ?), p. 15.
9. *Cardita barroneti* Mun.-Chalmas. Interior of right valve, from the Baba district, near Mossamedes, No. 6482, p. 31.
10. *Cardium* (*Trachycardium*) *reynoldsi* sp. nov. Exterior view of the holotype, a right valve, from the Baba district, near Mossamedes, No. 6480, p. 33.
11. *Cardium* (*Trachycardium*) *reynoldsi* sp. nov. Hinge of another right valve, No. 6481.



FIG.

12. *Cardium (Trachycardium) reynoldsi* sp. nov. Detail of ornamentation on posterior slope of same specimen as fig. 11, No. 6481.  $\times 2$ .
- 13-15. *Cardium (Trachycardium) reynoldsi* sp. nov. Three views of an old right valve, No. 6471.

PLATE IV.

*Senonian Fossils from Angola.*

The figures are of natural size unless otherwise stated.

1. *Trigonoarca angolensis* sp. nov. Interior view of right valve from Baba, No. 6469, p. 9.
2. *Trigonoarca angolensis* sp. nov. Exterior view of same specimen.
3. „ „ sp. nov. Dorsal view of same specimen.
4. *Nemodon natalensis* (Baily). Exterior view of left valve from Baba, No. 6467, p. 12.
5. *Actaeon* ? sp. From Mesados Cavalleros, near Mossamedes, No. 6489, p. 47.
6. *Cerithium* sp. From Mesados Cavalleros, near Mossamedes, No. 6493, p. 41.
7. *Tellina (Palaeomoera ?)* sp. Left valve from Baba, No. 6466, p. 38.
8. *Trigonoarca* cf. *trichinopolitensis* (Forbes). Left valve of specimen from Baba, No. 6465, p. 11.
9. *Trigonoarca* cf. *trichinopolitensis* (Forbes). Detail of ornamentation of umbonal region of left valve of same specimen.  $\times 2$ .
10. *Conus* ? sp. From Mesados Cavalleros, near Mossamedes, No. 6490, p. 46.
11. *Lima (Mantellum)* sp. Left valve from Mesados Cavalleros, near Mossamedes, No. 6485, p. 22.
12. *Strombus* ? sp. From Mesados Cavalleros, near Mossamedes, No. 6484, p. 44.
13. *Turritella (Haustator ?)* cf. *acanthophora* Müller. From Baba, No. 6472, p. 41.
14. *Turritella* sp. From Mesados Cavalleros, near Mossamedes, No. 6487, p. 41.
15. *Fusus* ? sp. From Mesados Cavalleros, near Mossamedes, No. 6485, p. 46.

PLATE V.

*Senonian Fossils from Angola.*

The figures are of natural size unless otherwise stated.

1. *Plicatula* sp. Specimen from Massangano, No. 6754, p. 20.
2. „ sp. Another specimen, No. 6752.
3. „ sp. Same specimen, lateral view, No. 6752.
4. *Cardium (Acanthocardium) denticulatum* Baily. Right valve from Massangano Fort, No. 6766, p. 34.
5. *Macrocallista* ? sp. Left valve of specimen from near Carimba, No. 6838, p. 37.
6. *Cyprimeria* ? sp. Left valve of specimen from Massangano, No. 6750, p. 36.

FIG.

7. *Pholadomya* aff. *tigris* Noetling. Right valve of specimen from Massangano Fort, No. 6767, p. 23.
8. *Pholadomya* aff. *tigris* Noetling. Dorsal view of same specimen.
9. *Venilicardia* cf. *nicaisei* (Coq.). Cast of right valve from Massangano, No. 6758b, p. 25.
10. *Venilicardia* cf. *nicaisei* (Coq.). Left valve of another specimen, No. 6758a.
11. *Pleuromya* ? sp. Right valve from near Capolo, No. 6786, p. 22.
12. *Nerita angolensis* sp. nov. Holotype, from Massangano, No. 6839, p. 39.
13. *Cryptorhytis* cf. *bleicheri* (T. and P.). Cast from Massangano, No. 6757, p. 46.